

Bats (Mammalia: Chiroptera) of the Eastern Mediterranean and Middle East. Part 16. Review of the distribution and taxonomy of bats in Egypt

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Received 14 October 2020; accepted 12 November 2020
Published 28 December 2020

Abstract. A comprehensive list of bat records available from Egypt was compiled from the literature (453 published and unpublished sources), supplemented by few records based on examination of museum specimens. The review of the bat records from Egypt is complemented with distribution maps, summaries of distributional status, and reviews of taxonomic opinions concerning the Egyptian populations of the particular species. From the territory of Egypt, at least 526 records (a number more than twice higher than that presented by Qumsiyeh (1985) in the previous review) of 20 bat species belonging to eight families are known; viz. *Rousettus aegyptiacus* (Geoffroy, 1810) (88 record sites), *Rhinopoma microphyllum* (Brünnich, 1782) (12), *R. cystops* Thomas, 1903 (40), *Rhinolophus clivosus* Cretzschmar, 1828 (27), *R. hipposideros* (Borkhausen, 1797) (6–7), *R. mehelyi* Matschie, 1901 (7–8), *Asellia tridens* (Geoffroy, 1813) (52), *Taphozous perforatus* Geoffroy, 1818 (27), *T. nudiventris* Cretzschmar, 1830 (29), *Nycteris thebaica* Geoffroy, 1813 (32), *Eptesicus bottae* (Peters, 1869) (11), *Hypsugo ariel* (Thomas, 1904) (16), *Pipistrellus kuhlii* (Kuhl, 1817) (78), *Vansonia rueppellii* (Fischer, 1829) (11), *Nycticeinops schlieffenii* (Peters, 1859) (2), *Otonycteris hemprichii* Peters, 1859 (24), *Barbastella leucomelas* (Cretzschmar, 1830) (8), *Plecotus christii* Gray, 1838 (33), *Tadarida teniotis* (Rafinesque, 1814) (13), and *Nyctinomus aegyptiacus* Geoffroy, 1818 (8). The occurrence of *Nycticeinops schlieffenii* in Egypt is here doubted based on the evaluation of the available evidence concerning the two known records. Since the separate species statuses of *Hypsugo bodenheimeri* (Harrison, 1960) and *Pipistrellus deserti* Thomas, 1902 were reasonably doubted in previous analyses, these taxa are no more included in the faunal list of Egypt. The previously published restrictions of type localities of *Rhinopoma microphyllum*, *Rhinolophus judaicus* Andersen et Matschie, 1904 (= *R. mehelyi*), *Asellia tridens*, *Taphozous perforatus*, *Nycteris thebaica*, *Vespertilio marginatus* Cretzschmar, 1830 (= *Pipistrellus kuhlii*), *Vansonia rueppellii*, *Plecotus christii*, *Dysopes rueppellii* Temminck, 1826 (= *Tadarida teniotis*), and *Nyctinomus aegyptiacus* were revised. *Nannugo Kolenatii* Müller, 1858 is here suggested to be regarded a junior synonym of *Vespertilio kuhlii* Kuhl, 1817 (= *Pipistrellus kuhlii*).

Key words. Distribution, taxonomy, Pteropodidae, Rhinopomatidae, Rhinolophidae, Hipposideridae, Emballonuridae, Nycteridae, Vespertilionidae, Molossidae, Egypt, North Africa, Middle East, Palaearctic.

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INTRODUCTION

The territory of the Arabic Republic of Egypt (1,010,408 km²) lies in two continents, Africa and Asia, and represents a natural transition between these two principal geographical units and their biotas. Covering the north-eastern section of the Sahara, the territory of Egypt also creates a part of the transition area between the Palaearctic and Afrotropical zoogeographical realms. And since the Egyptian territory lies at the southern shore of the Mediterranean Sea, also a transition from the mild Mediterranean climate in the north to the continental arid climate in the south is present within it.

Most of the territory of Egypt is covered by arid steppes and deserts of the Sahara, while slightly more humid North Saharan steppes are found only in very limited areas along the Mediterranean Sea shore (Burgess et al. 2004). Fertile soil occurs in some 4% of the country's area only, in the flooded savannah of the Nile Delta and along the Nile Valley, and in irrigated dry steppes of several desert oases (see Burgess et al. 2004). However, despite this rather poor biota of Egypt, the natural history of the country has been studied since the modern era, and the natural life is documented as long as the archaeological monuments, both being attractive in a similar degree for students and explorers. Even the bats of Egypt, due to their frequent presence inside various underground parts of archeological sites, were met as early as the exploration of Egyptian monuments started.

The oldest mention of bats from Egypt is an observation by a French renaissance traveller and naturalist Pierre Belon (1517–1564) from inside of the Great Pyramid of Giza (Belon du Mans 1553: 115): “Nous y trouuafmes des Souriz chauues differentes aux nostres, & à celles que i’ auoye auparauant veues dedens le labyrinthe de Crete : car les nostres n’ ont la queue plus longue que les æfles, mais celles de la Pyramide ont vne queue qui passe quatre doigts oultre les æfles,

longue comme aux Souriz.” This description* clearly indicates a record of bats of the genus *Rhinopoma*, as it was identified already by Anderson (1902). Another bat from Egypt was reported by Hasselquist (1757: 197), and this report represents the first bat name formally described from Egypt, *Vespertilio aegyptiacus*. However, this is an unavailable pre-Linnaean name, and moreover, it is a taxonomic mystery (for details see under *Rhinopoma microphyllum* below). Despite this bat and name were omitted by the first systematic compendia of the world fauna (Linnaeus 1758, 1766, Gmelin 1788), it is clear that the bats of Egypt represent one of the first bat faunas evaluated by taxonomists, along with the faunas of Europe, Brasil, or Moluccas, and undoubtedly the first of Africa.

The first modern research of bats of Egypt was started by Étienne Geoffroy Saint-Hilaire (1772–1844), who participated as a naturalist in the Egyptian Campaign of Napoleon Bonaparte in 1798–1801. Geoffroy and his co-workers gathered the first representative collection of natural history items from the country and besides others, they also documented eight species of bats from Egypt, six of them were then described by Geoffroy as new species, viz. *Rousettus aegyptiacus*, *Rhinopoma microphyllum*, *Asellia tridens*, *Taphozous perforatus*, *Nycteris thebaica*, and *Nyctinomus aegyptiacus* (Geoffroy 1806, 1810, 1813a, b, 1818†). Although *R. microphyllum* was described already by Brünnich (1782), the detailed redescription by Geoffroy (1818) was for a long time considered as the right discovery of the species.

Bats were then reported or even collected from Egypt by various explorers who travelled around Egypt and/or passed the country on the journey to the Sudan and Abyssinia (e.g., Burckhardt 1819, Belzoni 1821, Rüppell 1829, 1838, 1840, Russegger 1843, 1844, von Müller 1851, Lepsius 1852). Their field collections became parts of museum collections throughout Europe and this was followed by reports on specimens and new descriptions of bats from Egypt (Lichtenstein 1823, Temminck 1824–1827, 1835–1841, Cretzschmar 1826–1830, Rüppell 1842a, b, Gray 1843, 1848); this period brought discoveries of other seven Egyptian bat species, although some of them were discovered only in regions closely adjacent to Egypt, viz. *Rhinolophus clivosus*, *Taphozous nudiventris*, *Pipistrellus kuhlii*, *Vansonia rueppellii*, *Barbastella leucomelas*, *Plecotus christii*, and *Tadarida teniotis*.

In that period, various bat species of Egypt appeared in many compendia of bats or mammals even in those not directly dealing with the African or world fauna (Oken 1816, Desmarest 1820, Fischer 1829, Lesson 1834, Presl 1834, von Keyserling & Blasius 1839, de Blainville 1840, Schinz 1840, Wagner 1840, 1855, Gervais 1854, van der Hoeven 1855, Blasius 1857, Kolenati 1856, 1857b, 1860a, Fitzinger 1861, Brehm 1864, etc.).

* In the modern French, this text could read as follows: “Nous y trouvâmes des chauves souris différentes aux nôtres, et à celles que j’avais auparavant vu dans le Labyrinthe de Crète: Car les nôtres ont la queue plus longue que les ailes, mais celles de la pyramide ont une queue qui passe quatre doigts entre les ailes, longues comme pour les souris.” [We have found different bats from ours, or those I saw in the Labyrinth of Crete in the past, because ours have the tail as long as the wings, but those from the pyramid have a tail four fingers longer than the wings, the same length as mice have.]

† NOTE. Several authors stressed that *Description de l’Égypte*, a voluminous work edited by Edme-François Jomard (1777–1862) and published in 1809–1822 (first edition) and 1821–1830 (second edition), was actually not issued in the years mentioned in the particular books (mainly regarding some books of the first edition). Mainly for the taxonomic purposes, Sherborn (1897) suggested to restrict the years of issue of the natural history volumes of both series, based on technical evidence concerning the editorial and print works, etc.; here it concerns the chapters by Geoffroy (1818, 1828), and Audouin (1827). As for the descriptions of bats (i.e., Geoffroy 1818), some authors (e.g., Hollister 1918, Van Cakenberghe & De Vree 1994, 1998) suggested to prefer the originally written year of publication (1813) instead of that determined secondarily (1818). Although it is clear that the data contained in Geoffroy (1818) were available to other authors for preparation of their books (e.g., Oken 1816, Desmarest 1820) and therefore, it cannot be excluded that the respective book appeared earlier than in 1818, here we follow the broadly accepted Sherborn’s (1897) suggestions, namely because of the nomenclatural stability.

Alfred E. Brehm (1829–1884) travelled around Egypt during the German Expedition to Africa in 1847–1853 (Fig. 1), he observed several bat species there and reviewed the Egyptian animal life in his travel book series, with a special note on bats (Brehm 1855: 209): “Egypten ist das Land der letztgenannten Thiere [= Fledermäuse]. In allen Monumenten, in jedem alten Hause, in jedem dunklen Minaret wohnen sie zu Dutzenden; manche Höhlen des Gebirges, die Felsenspalten u. s. w. beherbergen Tausende. Man findet fast alle Familien dieser reichen Ordnung durch mehrere Arten vertreten. Nach Sonnenuntergang erfüllen Schwärme von Fledermäusen die Luft; inder Nähe Kairo’s fliegen sie zu Tausenden herum.” Brehm here clearly described how the travellers could meet bats and how the opportunities to collect them appeared. As a consequence, in the middle of 19th century, majority (55%) of the bat fauna of Egypt was known and described.

Along with the increasing knowledge of bats of Egypt, the knowledge of bat parasites also increased, in the first stage mainly of the arthropods. The first two bat parasite species – *Argas Fischeri* [= *Argas vespertilionis* (Latreille, 1796)] and *Eucampsipoda aegyptia* – although without a reference to a host, were described from Egypt by Audouin (1827) and Macquart (1851). However, the subsequent descriptions and reviews of parasites also mentioned the bat hosts and thus, they gave a direct information on bats and their distribution in Egypt (Frauenfeld 1856, 1857, Kolenati 1857a, c, 1858a, b, 1859a, b, 1860b, 1863).



Fig. 1. The inscriptions made by Alfred Edmund Brehm and his travelling companion, Ernst Bauerhorst (a German trader from Saint-Petersburg), in the Kiosk of Emperor Trajan in the Philae Temple Complex at the First Cataract of the Nile near Aswan, Egypt. Brehm passed the border between Upper Egypt and Nubia on 3 October 1851, on the way from Khartoum to Cairo (Brehm 1855; for other details see also Fischer 1985, Strehlow 1988, Haemmerlein 1991). Photo by P. Benda.

Table 1. Composition of the bat fauna of Egypt and the number of records of particular species according to subsequent reviews. Numbers of cases with inaccurate species identification (in respect to the current taxonomic opinion) are given in parentheses

species	Anderson 1902	Flower 1932	Qumsiyeh 1985	this review
<i>Rousettus aegyptiacus</i>	7	12	24	88
<i>Rhinopoma microphyllum</i>	[2]	2	9	12
<i>Rhinopoma cystops</i>	[8]	7	21	40
<i>Rhinolophus clivosus</i>	3	5	21	27
<i>Rhinolophus hipposideros</i>	—	—	1	7
<i>Rhinolophus mehelyi</i>	2	3	6	8
<i>Asellia tridens</i>	7	10	32	52
<i>Taphozous perforatus</i>	6	7	17	27
<i>Taphozous nudiventris</i>	3	3	11	29
<i>Nycteris thebaica</i>	4	7	22	32
<i>Eptesicus bottae</i>	1	1	2	11
<i>Hypsugo ariel</i>	—	1	[3]	16
<i>Pipistrellus kuhlii</i>	11	9	[33]	78
<i>Vansonia rueppellii</i>	1	3	5	11
<i>Nycticeinops schlieffenii</i>	1	—	2	2
<i>Otonycteris hemprichii</i>	2	3	15	24
<i>Barbastella leucomelas</i>	1	1	1	8
<i>Plecotus christii</i>	5	7	17	33
<i>Tadarida teniotis</i>	—	2	4	13
<i>Nyctinomus aegyptiacus</i>	1	2	4	8
total number of species	16	18	[22]	20
total number of records	65	85	250	526
average number of records per species	4.1	4.7	12.5	26.3

The zoological collections gathered from Egypt by various travellers between 1830–1860 (see e.g., Rüppell 1838, 1840, Frauenfeld 1856, von Heuglin 1857, 1859, 1861a, b, 1865, 1869, 1877, Hartmann 1863, 1868, Stresemann 1954, Klauswitz 2002) became available to authors specialised in bats that used this material for revisions and redescriptions of taxa occurring also in north-eastern Africa including Egypt (see Peters 1859, 1866, 1868, 1871a, Gray 1862, 1870, Fitzinger & von Heuglin 1866, Fitzinger 1869a, b, 1870a, b, c, d, 1872, Dobson 1875, 1876a, b, 1878, Trouessart 1879). Moreover, Müller (1858) and Peters (1859) described three new species of bats from Egypt, based on such type of collections; while *Nycticejus* [= *Nycticeinops*] *schlieffenii* and *Otonycteris hemprichii* are valid species till now, *Nannugo Kolenatii* Müller, 1858 has remained an enigmatic name whose real identity and synonymy is elucidated just here. Additionally, Lataste (1887) described another new bat species from Egypt, *Vesperugo Innesi*, today regarded a part of the species rank of *Eptesicus bottae* (see Harrison 1964).

In the last quarter of the 19th century, numerous papers were published that brought various new data on the distribution, taxonomy, morphology, and parasitology of bats of Egypt (Anderson 1881, Flower 1884, Klunzinger 1878, Dobson 1880, Lataste 1885, Nehring 1886, Doria 1887, Jentink 1887, 1888, Noack 1891, Sonsino 1895, 1896, Looss 1896, 1899, Trouessart 1897, Matschie 1899, Speiser 1901). In this era, the basic research of bat fauna in Egypt was mostly finished; all available relevant information on bats of the country was reviewed by Anderson (1902). In his book *Zoology of Egypt: Mammalia*, the first modern and comprehensive study of mammals of Egypt, more than 70 pages deal with bats. John Anderson (1833–1900), who travelled throughout Egypt for several years and collected animals, also visited various museum collections to examine Egyptian specimens, summarised in total 65 records of 16 bat species (Table 1) and for the first

time reported *Rhinolophus mehelyi* (under *R. euryale*) from the country. Almost immediately, these numbers were complemented by Thomas (1903b, 1904), who added two new bat species to the fauna of Egypt, *Rhinopoma cystops* and *Pipistrellus* [= *Hypsugo*] *ariel*.

In the years after the defeat of the Mahdist Regime in the Sudan (1899), when Egypt again became the main approach route to the hunting grounds in the southern Sudan, new bat records were obtained from Egypt and a new series of papers on Egyptian bats was published. The first decade of the 20th century represents the most productive period concerning the number of published papers about Egyptian bats, when 23 new papers appeared (Fig. 2). Numerous papers were published in the whole period from 1902 until the end of the WWI; besides others, these contributions dealt mainly with new records of bats (Schwann 1905, Sassi 1908, Bonhote 1909, 1912, Engelmann 1912, Revilliod 1913, Allen 1914, von Wettstein 1918), taxonomic revisions concerning the Egyptian bat populations (Andersen 1904, 1905a, 1906, 1907, 1912a, Trouessart 1904, Senna 1905, 1906, Cabrera 1912, Thomas 1913a), and records, descriptions, and reviews of bat parasites collected from bats in Egypt (Becker 1903, Rothschild 1903, Speiser 1904, Wahlgren 1904, Bezzi 1905, Looss 1907, Odhner 1910).

On the other hand, in the 1920s and 1930s, between the world wars, only few papers on bats of Egypt appeared, most of them were focused on bat parasites (Hirst 1923, Kessel 1925, Boulenger 1926, Meggitt 1927, Gohar 1934, Jobling 1934, 1939, Azim 1936, Jordan 1937, Karaman 1939) and only two brought new bat records (de Beaux 1923, 1931). However, two very important contributions were published in this period, a new summary of Egyptian mammals by Flower (1932) and a comprehensive taxonomic checklist of African mammals by Allen (1939). Stanley S. Flower

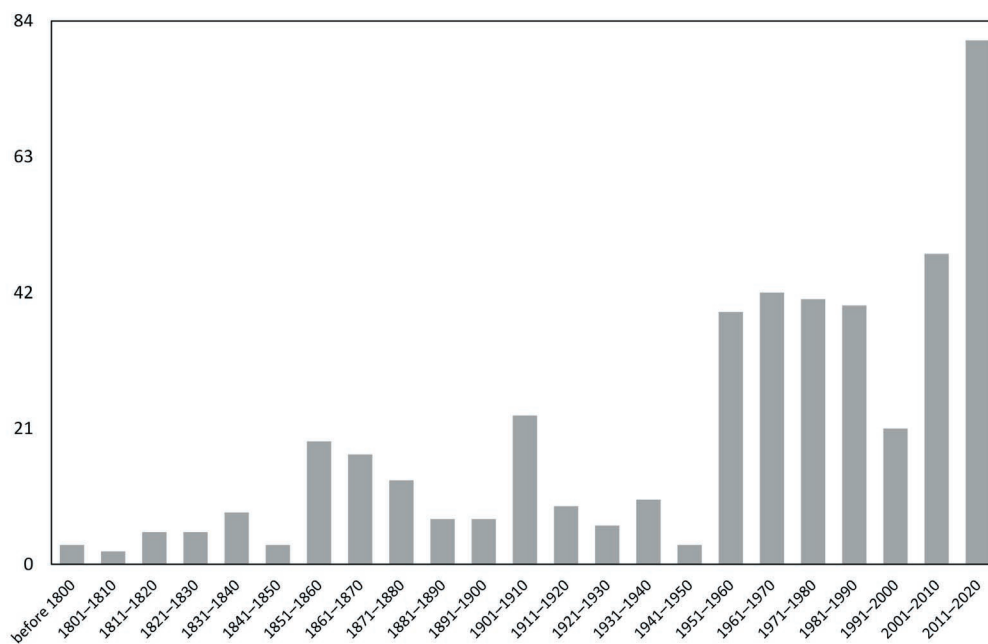


Fig. 2. Numbers of papers providing occurrence records of bats from Egypt published in particular decades of the period 1800–2020 and before 1800.

(1871–1946), a director of the Giza Zoological Gardens in 1898–1926, travelled around Egypt and gathered collections of various animals. In his paper on Egyptian mammals, he provided an updated list of the country's fauna (Flower 1932) containing in total 85 records of 18 species of bats (he omitted *Nycticeinops schlieffenii*, see Table 1). At his position of the zoo director, Flower initiated the creation of the Fish Garden in the Gezira (Zamalek) Island in the Nile between Cairo and Giza; the central exhibition building of the Garden, the 'Grotto' aquarium, serves – unintentionally – as a colony roost of *Rousettus aegyptiacus* for a long time (see Kaisila 1966, Morsy et al. 1986a, b, Benda et al. 2011a, 2012a).

After the WWII, a new era of the research of bats (along with other small mammals) started in Egypt (see Fig. 2). Parallely, two groups, partially co-operating, initiated a profound investigation of the bat fauna of the country. The first group was established by Kamal M. Wassif (1916–2001), a professor in zoology at the Ash Shams University in Cairo. He with his co-workers, and namely with his former student Gamal A. Madkour (publishing in 1961–2007), later a professor at Tanta University, produced a large number of papers on the bats of Egypt. Most of their scientific work on bats considered anatomy and morphology, but faunal research was also presented by this group; anyway, faunal data are available in most of their production, despite the primary focus of particular papers (Wassif 1946, 1948, 1949, 1953, 1959a, b, 1962, 1976, 1995, Wassif & Hoogstraal 1954, Madkour 1961, 1975, 1976a, b, c, d, 1977a, b, c, d, 1978, 1982, 1987, 1988, 1989, Wassif & Madkour 1963, 1969, 1970, 1971, 1972a, b, c, 1973, 1974, Madkour et al. 1982, 1983, Wassif et al. 1984, Gaisler et al. 1972, El-Desouki et al. 2006, Mansour et al. 2006a, b, Attia et al. 2007a, b, El-Naggar et al. 2007). Concerning the bat faunal studies, those by Wassif (1946, 1953, 1959a, 1962), Wassif & Hoogstraal (1954), Gaisler et al. (1972), Madkour (1977a, b), and Wassif et al. (1984) can be selected as the most important. Among them, Wassif & Hoogstraal (1954) added the last bat species to the fauna of Egypt, *Rhinolophus hipposideros*, and then the Egyptian fauna increased up to 20 species, a number which remains the same in the present fauna of the country.

The Medical Zoology Department of the U.S. Naval Medical Research Unit No. 3 (NAMRU-3) represented the other group of research that started the mammal studies of Egypt at the end of the WWII. The formal head and a leading research person of this unit was an entomologist and parasitologist Harry Hoogstraal (1917–1986). This group gathered an extensive material of small mammals, currently housed mainly in the USNM and FMNH collections; however, its main publication focus was ectoparasitology (Hoogstraal 1952, 1953, 1954a, b, 1955, 1956, 1957, 1958, Traub 1954, 1963, Theiler & Hoogstraal 1955, Keegan 1956, Floyd & Hoogstraal 1956a, b, Hoogstraal et al. 1957a, b, Traub & Hoogstraal 1957, Hoogstraal & Kaiser 1958, Yunker et al. 1959, Usinger 1960, 1966, Hoogstraal & Traub 1963, Darwish & Hoogstraal 1981, etc.), and although the parasitologic papers contained some faunal data, they published only three papers dealing directly with faunal data on bats (Setzer 1952, Sanborn & Hoogstraal 1955, Hoogstraal 1962). Finally, the data on terrestrial mammals gathered by the NAMRU-3 were published by Osborn & Helmy (1980) and those on bats by Qumsiyeh (1985). The latter book, a MSc Thesis defended at the University of Connecticut, has represented the most comprehensive review of the knowledge of bats of Egypt ever published, and until now, it has been the main reference work concerning the Egyptian bat fauna. Mazin B. Qumsiyeh (born 1957), now a professor at the Bethlehem University, Palestine, then examined more than 2,500 specimens of bats spread across 20 museum collections, these data represented 250 records of 22 species (Table 1). However, according to the current taxonomy, Qumsiyeh (1985) reported only 20 species, since two bat species listed by him, *Pipistrellus aegyptius* (= *P. deserti*) and *Pipistrellus bodenheimeri*, were later shown to be included into other species, *Pipistrellus kuhlii* and *Hypsugo ariel*, respectively (see Benda et al. 2008, 2015).

Although many papers bringing data on bats of Egypt appeared in the period 1950–1990, some 160 publications in total (Fig. 2), only a smaller part of this number dealt with bat biology, taxonomy, and distribution, while most of them were focused on bat parasites. This disproportion is more apparent in the first two decades of this period, when almost two thirds of the published papers on the bats of Egypt (62.9%) represented parasitological literature (Jobling 1952, 1954, 1956, Smit 1953, Theodor 1954, 1955, 1956, 1957, 1967, 1968, Theodor & Moscona 1954, Dubois 1955, 1960, 1962, Hopkins & Rothschild 1956, Wells & Randall 1956, Hubbard 1960, Rudnick 1960, Usinger 1960, 1966, Maa 1961, 1964, 1965, Macy et al. 1961, Heyneman & Macy 1962, Myers et al. 1962, Sonenshine et al. 1962, 1966, Fain 1963, Radovsky & Yunker 1963, Hůrka 1964, Macy 1964, Mohammed & Saoud 1964, 1965, Till & Evans 1964, El Sabban et al. 1967, Radovsky 1967, Rifaat et al. 1967, Dusbábek 1969); for the first time, several papers dealing with echolocation of Egyptian bat species were published at that time (Möhres & Kulzer 1955, 1956a, b, Kulzer 1956), and only less than a third of the number of bat publications (30.6%) were papers whose main object was an Egyptian bat and various aspects of its biology (Hayman 1949, Kulzer 1958, 1963, 1966, Eisentraut 1959, Lanza 1960, Harrison 1961, 1963a, 1964, Hill 1961, Felten 1962, Lewis & Harrison 1962, Bauer 1963, von Lehmann 1964, 1966, Hanák 1966, Kaisila 1966, Maser 1966, Kock 1969).

In subsequent two decades (1971–1990), the numbers were rather balanced and the number of parasitological papers on Egyptian bats was smaller than that on bat biology, making up only 43.1% of the number, and for the first time the Egyptian authors prevailed over the non-Egyptian among the authors of parasitological papers in this stage (Štys 1971, Baruš 1973, Haas & Tomich 1973, Černá & Ryšavý 1976, Saoud & Ramadan 1976a, b, 1977a, b, c, d, 1982, Varma & Converse 1976, Hafez et al. 1977, El Naffar Laila et al. 1978, Fahmy et al. 1978, 1984, Kock & Nader 1979, Blackwell 1980, Hafez et al. 1984, Morsy et al. 1986a, b, Ramadan 1986, Uchikawa 1986, Morsy et al. 1987a, b, Kaaoud et al. 1989, Uchikawa & Kock 1989, Hartwich & Kilias 1990); three papers on the echolocation of Egyptian bats appeared (Pye 1972, Simmons et al. 1984, Herbert 1985) and more than a half of the publications (52.3%) of this period dealt with bat biology, morphology, taxonomy, and distribution (Hayman & Hill 1971, DeBlase 1972a, b, 1980, Kock et al. 1972, DeBlase et al. 1973, Schlitter & DeBlase 1974, Koopman 1975, Felten et al. 1977, Hill 1977, Corbet 1978, Gaisler & Baruš 1978, Spitzenberger 1979, Nader & Kock 1980, 1983a, b, c, Freeman 1981, Kock 1981, Nader 1982, Shehata 1983, Koch-Weser 1984, Kock & Nader 1984, Kitchener & Caputi 1985, Kulzer et al. 1985, Hood & Baker 1986, Al-Badry et al. 1987, Hill & Harrison 1987, Owen & Qumsiyeh 1987, Harrison & Makin 1988, Osborn 1988, Robbins & Sarich 1988, Condò et al. 1989, Ibáñez & Fernández 1989); in three papers, the distribution records of bats were documented from the owl pellets (Goodman 1986, 1990, Handwerk 1990). However, in the total number of publications issued in 1971–1990, the Egyptian authors still represented a minority. Concerning the distribution and taxonomy of the bats of Egypt of this period, besides the book by Qumsiyeh (1985), several other important contributions were published (Hayman & Hill 1971, DeBlase 1972b, Koopman 1975, Corbet 1978).

While only 21 papers containing data on bats of Egypt were published in the 1990s, more than a twice higher number appeared in the 2000s (48) and an almost four times higher number in 2010–2020 (81), both the latter numbers were historically the highest records at their times (Fig. 2). So, almost a third (30.0%) of the known publications and theses bringing data on the bats of Egypt were published in the 21st century. This increasing number of publications has been accompanied by increasing research and publication activities of the Egyptian authors, in the particular decades of the period 1990–2020, the proportion of the home authors represented always between one third and one half of the whole author amount (34.0–54.2%). Simultaneously, in this period the proportion of the parasitological (and epidemiological) papers decreased (see below).

In the period 1991–2000, almost a half of the papers (45.8%) was focused on the fauna and taxonomy of Egyptian bats, although some data were included in compendia or taxonomic revisions (Churcher 1991, Harrison & Bates 1991, Koopman 1993, Tawfik et al. 1993, Bergmans 1994, Van Cakenberghe & De Vree 1994, 1998, Wassif 1995, Kock 1999a, Basuony 2000, Kruskop & Lavrenchenko 2000); a third of the papers (37.5%) contained parasitological information (Coetzee & Segermann 1992, Klompen 1992, Galal & Abdel 1993, Abo-Taka 1994, Hafez et al. 1994, Adams & Lewis 1995, Badavi & Movsesân 1995, El-Damarany et al. 1997, Al-Bassel & Ashour 1999), three papers dealt with karyology (El-Dawy & Ibrahim 1994, Yaseen et al. 1994, Riad et al. 2000) and one with ecology (Basuony 1998).

In the following decade, more than a half of the papers (58.5%) was represented by faunal and taxonomic contributions (Kock et al. 2002, Csorba et al. 2003, Hoath 2003, Hoofer 2003, Hoofer & Van Den Bussche 2003, Benda et al. 2004a, b, c, 2006, 2007, 2008, 2009, 2010, Dietz 2005a, b, Gautier 2005, Ghosh 2005, 2008, Bates et al. 2006, Dietz & Maltby 2006, Hoofer et al. 2006, Horáček et al. 2006, Spitzenberger et al. 2006, Hulva et al. 2007, Mayer et al. 2007, Truscott 2007, Zhang et al. 2007, Turni & Kock 2008, Basuony et al. 2010, Benda & Gvoždík 2010), ten papers (18.9%) dealt with bat parasites (Abdel-Rahman et al. 2001, Ammar et al. 2003, El Garhy 2003, Abed et al. 2005a, b, c, Garo & El Garhy 2005, Lewis 2006, Hastriter 2007, Han et al. 2010), and less than a quarter of the published papers (22.6%) concerned various aspects of bat biology, including morphology, histology, cytology, physiology, and ecology (Farid & Lotfy 2001, Selim 2002, Basuony 2003, Bergemann 2003, El-Desouki et al. 2006, Mansour et al. 2006a, b, Attia et al. 2007a, b, El-Naggar et al. 2007, Selim et al. 2008, Sakr & Ramadan 2010). Concerning the bat distribution and taxonomy in Egypt, perhaps the most significant additions to this type of information in this period were the papers on the bats of Sinai and oases of the Western Desert (Dietz 2005b, Dietz & Maltby 2006, Truscott 2007, Benda et al. 2008, 2011a, 2014a, Foui 2011). These data enlarged and detailed the knowledge of the bat fauna of Sinai, where some species were found for the first time after their discovery in this peninsula (*Rhinolophus hipposideros*, *Barbastella leucomelas*) and some species were found there even for the first time (*Rousettus aegyptiacus*, *Rhinopoma cystops*, *Taphozous perforatus*, *Eptesicus bottae*, *Tadarida teniotis*); similar additions to the knowledge of bats were made in the Western Oases. Some of these new records enabled to evaluate the phylogenetic and taxonomic positions of the Egyptian populations in several species, such as *Rousettus aegyptiacus*, *Rhinolophus clivosus*, *R. hipposideros*, *Hypsugo ariel*, *Pipistrellus kuhlii*, and *Barbastella leucomelas* (for details see under these species below).

In the latest decade, 2011–2020, the faunal and taxonomic papers represented less than a half (47.4%) of published contributions on bats of Egypt (Ali 2011, Benda et al. 2011a, b, c, 2012a, b, 2014a, b, 2015, 2016a, 2017, Dornburg et al. 2011, Mlíkovský et al. 2011, Veith et al. 2011, Benda & Vallo 2012, Hulva et al. 2012, Stoffberg et al. 2012, Dool et al. 2013, Horáček et al. 2013, Carpenter et al. 2014, Soliman & Mohallal 2014, Benda & Gaisler 2015, Eissa & Yassin 2015, Kruskop 2015, Bray & Benda 2016, Ziegler et al. 2016, Centeno-et al. 2017, Pitt 2017, Mohallal & Ahmed 2018, Van Damme et al. 2018, Kruskop et al. 2019, Uvizl et al. 2019, Amorim et al. 2020); besides others, three technical reports are important among them that brought data on the rather rare desert bats from remoted arid areas (Anonymous 2011, Foui 2011, Bergen et al. 2018). Only a small proportion of papers (15.8%) dealt with bat parasites and epidemiology (Fayed et al. 2011, Quetglas et al. 2012, Negm & Fakeer 2014, Abdel-Ghaffar et al. 2015, El Maleck et al. 2015, Shehata et al. 2016, Ali et al. 2017, Greiman et al. 2017, Ammar 2018, Kandeil et al. 2019, El Taweel et al. 2020, Kandeil et al. 2020), and more than a third of the papers published in this period (36.8%) brought data on morphology (including histology and karyology), physiology, ecology, and ethology of bats in Egypt (Sayed 2011, Selim & El Nahas 2012, 2015, Abumandour & El-Bakary 2013, Lučan & Šálek 2013, Rizk & Eissa 2013, Taki-El-Deen et al. 2013, Abdel-Rachied

et al. 2014, Abumandour 2014, Lučan et al. 2014, Selim 2015, Soliman 2015, Soliman et al. 2015, Mansour et al. 2016, 2017, Abumandour & Pérez 2017, Eisa 2017, Mahmoud & Soliman 2018, Morsy et al. 2018, Sheta & Behary 2019, Taha & Soliman 2019, Aboelnour et al. 2020, Bachorec et al. 2020a, b, Elkhateeb et al. 2020, Haggag et al. 2020, Massoud & Abumandour 2020).

As a result, the number of papers bringing data on bats of Egypt is enormous. Altogether, more than 450 publications, theses, and various reports were finally examined for information on bat distribution in Egypt. As stressed above, most of these revised papers are focused on distribution, taxonomy, and various aspects of biology of bats and a high percentage concerns also the parasitological and epidemiological contributions. However, also the archeozoological papers that brought data on bat findings from Egypt were included, although these records are extremely scarce in the record (Batravi 1948, Boessneck & von den Driesch 1987, Boessneck 1988, Gautier 2005, Pokorný et al. 2009, Šůvová & Krejčí 2015, Dulíková et al. 2018, Odler et al. 2019, Woodman & Ikram 2020). Last but not least, since bats are frequent inhabitants of the cultural monuments, they are sometimes in conflict with the caretakers of the monuments who try to keep the wall paintings and other structures to be not affected by bat guano ('bat blood' in their terminology), the papers documenting these conflicts and success in restorations of the damages caused by the occurrence of bats also appeared (Davies & Gardiner 1936, Pinch Brock & Shaw 1997, Pinch Brock 2000, Evan & Mourad 2018, Abdelaal & Sandu 2019, Bakr & Abd El Hafez 2012); some of them contain also information on particular bat species and are included in our review. Only few museum specimens that came from unpublished occurrence sites were found in museum collections and these are added to the distribution review.

This rather extensive data material is here presented with the intention to provide an up-to-date picture of the bat distribution in Egypt as well as to present the development of such knowledge in particular species. The opportunity of preparation of the distribution review was used also for a simultaneous preparation of the up-to-date summary of taxonomic opinions concerning particular bat species inhabiting Egypt.

MATERIAL AND METHODS

Records and distribution

We tried to make the reviews of records of particular bat species from Egypt as comprehensive as possible, based almost solely on published records, in total 453 sources were used. Records based on museum specimens were used few times, only for the records that were available from an unpublished locality. The published records are arranged into two paragraphs, (1) as geographically precise records, defined by more or less accurate description of the locality, and (2) as geographically imprecise records that cover undefined record sites, described as large regions, such as 'Egypt', 'Nubia', 'Sinai' etc., or as a combination of sites/regions, e.g., 'Cairo and Giza Governorates', etc.

The lists of records (arranged in alphabetical and/or chronological orders) include, for each item, the following information: name of the locality (each record is primarily listed by a name of the nearest settlement or notable physical feature), grouped according to the name of governorate (province) where the record site lies, [in brackets, serial number of the locality is given as indicated in the map], and/or description of the record site, date, number of recorded bats with indication of their sex and age (for details see Abbreviations below), and a reference to museum collection/s.

The records published before 1905 (when the first comprehensive review of distribution data was available in the book by Anderson 1902) are reported completely, i.e., also the cases where undefined record sites do not comprise a defined collection/observation of individuals and could thus represent a secondary record or a general mention of occurrence. The secondary records published after 1905 were excluded from the record review. The secondary record is a mention taken from a published source complemented by a reference to previous publication; where one record is published multiple times based on e.g., multiple original examination of an identical museum specimen, each such evidence is considered as original.

Where a name of governorate is used as a name of the record site, based apparently on a real finding, we give the name of governorate as the record site identically as in the original source. When a particular site is published later from the respective governorate as a site that can be co-identified with the previous record (based on certain common features), both

records are considered to originate from one site. Where such a particular site is not published (or known from another source, such as e.g., museum evidence), the governorate capital is tentatively reported as the site of record (and marked in the respective map). All sites for which distinct names were provided were considered as distinct localities of records. The only exceptions are the sites in the regions of Luxor and Giza; various names have been used for various parts of these areas and sometimes different names are used for the same site and/or the names are interchanged. Therefore, all site names in these regions are considered as single site, Luxor and Giza (= Giza Pyramids), respectively.

For each species, the reviews of distribution evaluate its Egyptian occurrence based on the records from particular geographical regions of Egypt (see Table 2). For this purpose, the territory of Egypt has been divided into seven 'geographical regions', namely (1) Western Desert: the area west of the Nile Valley and Delta, and south of the Mediterranean Sea shore, including all western oases and Wadi El Natrun; (2) Nile Valley: the areas along the Nile River south of Cairo (south of ca. 29°35'N), including the Faiyum depression; (3) Mediterranean Sea shore: the areas along the shore of the Mediterranean Sea west and east of the Nile Delta, excluding the Mediterranean Sea shore of Sinai; (4) Cairo Region: the area of mainly urban habitats of the Cairo megapolis, including Giza, Helwan, Shubra El Khayma and other suburbs; (5) Nile Delta: the area of the fertile land north of Cairo, limited by the areas along the Rosetta Branch in the west and those along the Ismailia Canal, and west of the Suez Canal north of Ismailiya; (6) Red Sea shore and mountains: the areas between the Nile Valley, Red Sea shore, the Ismailia Canal, and the southern part of the Suez Canal; (7) Sinai: the area of the Sinai Peninsula between the Suez Canal and the Egyptian-Israeli border.

Geographical terms used (in alphabetical order; for definitions of the 'geographical regions' see above)

Anatolia – a subunit of the Middle East; the Asian part of the present Republic of Turkey;

Arabia – a subunit of the Middle East; the part of the Arabian Peninsula south of the northern borders of Syria and Iraq;

Holy Land – Israel and Palestine Lands, western part of Jordan and the south-westernmost part of Syria (Golan Heights); a subunit of the Levant;

Levant – a subunit of the Middle East; comprising Jordan, Israel, Palestine Lands, Lebanon, Syria, and mostly also Cyprus and Hatay (i.e., the Levant in the broader sense);

Mesopotamia – a subunit of the Middle East; lowland territories of middle and lower parts of the Euphrates and Tigris Rivers in southeastern Turkey, eastern Syria, Iraq, and southwestern Iran;

Middle East – region covering the countries of Arabia, Cyprus, Anatolia, and Iran;

North Africa – countries of the supra-Saharan part of Africa (Western Sahara, Morocco, Algeria, Tunisia, Libya, Egypt), or the Palaearctic part of Africa, roughly the part of Africa north of the Tropic of Cancer (23°26'15"N);

Syria – the territory of the present Syrian Arab Republic according to the international law, i.e., including the Golan Heights.

Taxonomy

The taxonomy chapters summarise the taxonomic opinions on the Egyptian populations of the particular bat species as they appeared throughout history. Since during the last two hundred years the opinions concerning the genus affiliations of particular species changed many times and mostly had no influence on the specific or intraspecific positions of the Egyptian populations of bats, the comments on the opinions concerning the particular genera are mostly omitted. Besides the review of taxonomy, in all relevant cases, the definition of type locality is revised to be in accordance with the Article 76 of the ICZN (1999).

Since the keys for determination of the bat species of Egypt were published repeatedly many times (Sanborn & Hoogstraal 1955, Hayman & Hill 1971, Wassif et al. 1984, Qumsiyeh 1985, Dietz 2005a), the problematics of the species identification are mentioned only in the cases where it is necessary for the review of taxonomic opinions.

ABBREVIATIONS

Collection acronyms

AMNH = American Museum of Natural History, New York, United States of America; – ASUC = Wassif's Collection, Ain Shams University, Cairo, Egypt; – BMNH = Natural History Museum, London, United Kingdom; – CDIS = Christian Dietz private collection, Heigerloch, Germany; – CMNH = Carnegie Museum of Natural History, Pittsburgh, United States of America; – CMSNF = Museum Centre of Natural History and Physics, Frederic II University of Naples, Naples, Italy; – FMNH = Field Museum of Natural History, Chicago, United States of America; – HUJ = Hebrew University, Jerusalem, Israel; – HZM = Harrison Institute, Sevenoaks, United Kingdom; – IAN = Iyad A. Nader private collection, Riyadh, Saudi Arabia; – IMC = Indian Museum, Calcutta, India; – IRSN = Royal Belgian Institute of Natural Sciences, Brussels, Belgium; – IVB = Institute of Vertebrate Biology, Czech Academy of Sciences, Brno, Czech Republic; – KLHB = Royal High School of Agriculture, Berlin, Germany; – MCZ = Louis Agassiz Museum of Comparative Zoölogy, Harvard University, Cambridge, United States of America; – MHNG = Natural History Museum, Geneva, Switzerland; – MNCN = National Museum of Natural History, Madrid, Spain; – MNHN = National Museum of Natural History, Paris, France;

– MQC = Mazin Qumsiyeh private collection, Hebron, Palestine; – MSNG = Civic Museum of Natural History Giacomo Doria, Genoa, Italy; – MSNM = Civic Museum of Natural History, Milan, Italy; – MUB = Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; – MVZB = Museum of Vertebrate Zoology, University of California, Berkeley, United States of America; – MZUF = Natural History Museum, Zoology “La Specola”, Florence, Italy; – NHMB = Natural History Museum, Basel, Switzerland; – NMP = National Museum (Natural History), Prague, Czech Republic; – NMW = Natural History Museum, Vienna, Austria; – RNHL = Naturalis Biodiversity Center (formerly Royal Museum of Natural History), Leiden, the Netherlands; – ROM = Royal Ontario Museum, Toronto, Canada; – SMF = Senckenberg Research Institute and Museum, Frankfurt am Main, Germany; – SMND = Senckenberg Natural History Collections, Dresden, Germany; – SMNS = State Museum of Natural History, Stuttgart, Germany; – TAU = The Steinhardt Museum of Natural History, Tel Aviv University, Tel Aviv, Israel; – TTU = Museum of Texas Tech University, Lubbock, United States of America; – USNM = National Museum of Natural History, Smithsonian Institution, Washington, United States of America; – WICA = Willy Issel private collection, Augsburg, Germany; – YPM = Peabody Museum of Natural History, Yale University, New Haven, United States of America; – ZFMK = Zoological Research Museum Alexander Koenig, Bonn, Germany; – ZIN = Zoological Institute, Russian Academy of Sciences, Saint-Petersburg, Russia; – ZMA = Zoological Museum Amsterdam, the Netherlands; – ZMB = Natural History Museum, Berlin, Germany; – ZMH = Zoological Museum, University Hamburg, Germany; – ZMUC = Zoological Museum, University of Copenhagen, Denmark.

Other abbreviations

a = adult; – coll. = collected; – det. = identified using by a bat detector; – f = female; – G = pregnant; – j = juvenile; – m = male; – net. = netted; – obs. = observed; – s = subadult.

LIST OF SPECIES

Rousettus aegyptiacus (Geoffroy, 1810)

RECORDS. Published data: A s y u t: El Bayayda, El shekh Sayed cave [1], several inds. (Elkhateeb et al. 2020); – Siout [2], tomb, obs. 200 inds. (Gurney 1876); Tomb behind Assiut, 1 fa (Anderson 1902); Assiut, 21 January 1892: 1 fa, BMNH (Andersen 1912a); Assiut Province, April 1918: obs. (Flower 1932); Asyut, 1 ind., BMNH (Qumsiyeh 1985); Nr Assiut, BMNH (Bergmans 1994); Assiut Governorate, different localities, capt. 179 inds. (Abed et al. 2005a, c, El Maleck et al. 2015); Assiut University, agricultural farm, 1 ind. (Negm & Fakeer 2014); – Walidiya [3], inds. (Hafez et al. 1977, 1984); El Walidiya, 1 ind., FMNH (Qumsiyeh 1985); El Walidiya, 2 April 1957: 3 ma, FMNH (Bergmans 1994). – A s w a n: Abu Simbel [4], temple, 21 January 1963: 1 ind., RNHL (Bergmans 1994); – Assuan [5] (Kulzer 1958); Aswan, tomb across the Nile (Maser 1966); Aswan, February 1949: 1 m, ASUC (Wassif et al. 1984); Aswan, palm garden at the N edge of the town, 24 January 2010: net. 47 inds., 10 January 2011: net. 54 inds. (Benda et al. 2011a); Aswan, Tombs of the Nobles, 9 January 2011: obs. a colony of ca. 300 inds. (Benda et al. 2011a); Aswan, labyrinth of old mines NE of the town, 9 January 2011: obs. a colony of ca. 70 inds. (Benda et al. 2011a); Aswan Tombs, western bank of Nile, 21 December 1963: 11 inds, YPM (Dornburg et al. 2011); Aswan, 24 January 2010: 1 m, NMP (Benda et al. 2012a, Van Damme et al. 2018); Aswan, 22 inds. (Hulva et al. 2012); – Aswan, Temple of Philae [6], 6 December 2011: obs. feeding traces (Benda et al. 2011a); – El A'qab [7], palm garden, 25 January 2010: net. 44 inds. (Benda et al. 2011a); El A'qab, 17 inds. (Hulva et al. 2012); – Kom Ombo [8], inds. (Hafez et al. 1984); – Nag Misaw [9], 12 & 16 February 1964: 5 inds., YPM (Dornburg et al. 2011). – B a n i S u e f: Bani-Suef province, inds. (Fayed et al. 2011); Bani Suef [10], old abandoned house, January–May 2018: net. 10 inds. (Sheta & Behary 2019); – El Riyad [11], 1 December 1988: coll. 1 ind. from *Asio otus* pellets (Handwerk 1990). – B o r s a' i d: Port Said [12], 22 January 1910: 1 ind. (Flower 1932). – D u m y a t: Damietta [13], palms, inds. (Gurney 1876); Damietta, 1 ind., KLHB (Nehring 1886); Damietta, 2 inds., BMNH, USNM (Qumsiyeh 1985); Damietta, BMNH (Bergmans 1994); Damietta, old abandoned house, January–May 2018: net. 10 inds. (Sheta & Behary 2019). – E d D a q a h l i y a h: Ras El Khalig (Shirbin) [14], inds. (Hafez et al. 1977); – Taranis el Arab (Simbillawein) [15], inds. (Hafez et al. 1977). – E l B e h e i r a h: Edfina [16], fruit farms and old houses, 12 inds. (Abumandour & El-Bakary 2013); Edfina, fruit farms and old houses, 8 inds. (Abumandour 2014); Beheira Governorate, coll. inds. (Eissa & Yassin 2015); Edfina, farms and old houses, 14 inds. (Abumandour & Pérez 2017); – Wadi Natroun [17] (Hoogstraal 1962). – E l E s k e n d e r i y a h: Burg El-Arab [18], January 1977: 1 f, January 1980: 1 f, ASUC (Wassif et al. 1984); Burg El Arab (Wassif 1995). – E l E s m a' i l i y a h: Ismailia [19], 1915 (Flower 1932); Ismailia Governorate, coll. inds. (Eissa & Yassin 2015). – E l F a y u m: Medinet el Fayum [20], 1 ma, 1 mj, 5 fa, 3 fj (Anderson 1902); Faiyum (Sanborn & Hoogstraal 1955); Medinet el Fayum, 1893: 1 ma, ZMA (Bergmans 1994); El-Fayoum Governorate, vegetative garden areas, coll. inds. (Sakr & Ramadan 2010, Taki-El-Deen et al. 2013); Fayoum province, inds. (Fayed et al. 2011); Fayoum, old abandoned house, old abandoned house, January–May 2018: net. 10 inds. (Sheta & Behary 2019); Fayoum governorate, 7 inds. (Aboelnour et al. 2020); Fayoum District, April–July 2018: 9 inds. (Massoud & Abumandour 2020). – E l G h a r b i y a h: Mahallet el Kebir [21], 2 ma, 1 fa (Anderson 1902); Mehalleh el Kebir, 1 ma, 1 fa, BMNH (Andersen 1912a); Mehalla El Kubra, 2 inds., BMNH (Qumsiyeh 1985); Mahallet el Kebir, BMNH

(Bergmans 1994); Gharbia Governorate, coll. inds. (Eissa & Yassin 2015). – El Jizah: Abu Rauwash [22], inds. (Hafez et al. 1977, 1984); Abu-Rawash, 8 inds. (Farid & Lotfy 2001 [as *Pteropus*]); Abu-Rawash, late March 2004: coll. inds. (El-Desouki et al. 2006, Attia et al. 2007a, b); Abu-Rawash area, 6 inds. (Ali 2011); Abu-Rawash area, inds. (Sayed 2011); Abu rawash area, coll. inds. (Abdel-Rachied et al. 2014); Abu-Rawash, 2010 and 2011: coll. 20 inds. (Selim & El Nahas 2015); Abo Rawash, 2015–2016: 24 inds. (Ali et al. 2017); Abu Rawash, coll. 30 ma (Mahmoud et al. 2018); Abu Rawash farm, coll. 2 ma, 2 fa (Haggag et al. 2020); – Bahariya Oasis, Bawiti [23], rocky escarpment in a volcanic hill, rock crevice, 17 October 2011: obs. 1 ind. (Benda et al. 2011a); – Bahriya Oases, El Buaiti [24], inds. (Hafez et al. 1984); Bahariya Oasis, Bawiti, palm garden, 18 January 2010: net. 3 inds., NMP, 30 December 2010: net. 7 inds., 2 January 2011: net. 2 inds., 23 March 2011: net. 8 inds., 16 & 17 October 2011: net. 4 inds. (Benda et al. 2011a); Bawiti, Bahariya Oasis, 18 January 2010: 1 m, NMP (Benda et al. 2012a, Van Damme et al. 2018); Bawiti, Bahariya Oasis, tomb, 19 January 2010: obs. 1 ind., 17 October 2011: obs. 1 ind. (Benda et al. 2011a); Bawiti, Bahariya Oasis, 4 inds. (Hulva et al. 2012); – Bahriya Oasis, El Hara [25], inds. (Hafez et al. 1984); – Birqash [26], inds. (Kandeil et al. 2020); – El Aiyat [27], 2 inds., FMNH (Qumsiyeh 1985); Aiatt district, 40 inds. (Eisa 2017); – basse Egypte, plafond d’une des chambres de la grande Pyramide [= El Jizah] [28], plusieurs inds. (Geoffroy 1810 [as *Pteropus Egyptiacus*]); In der Kammern der Pyramiden (Oken 1816); plafonds des chambres de la grande pyramide, abondance (Geoffroy 1818, 1828); Basse-Égypte, plafond d’une des chambres de la grande pyramide (Temminck 1825 [as *Pteropus Geoffroyi*]); in den Gewölben Pyramiden (Wagner 1840 [as *Pteropus Geoffroyi*]); chambres des pyramides (Gervais 1854); Gewölben der Pyramiden in der Nähe von Gizeh bei Cairo (Fitzinger 1869a); Ægyptus (in Pyramidis) (Trouessart 1897); [El Jizah], Zoological Gardens (Bonhote 1909); Giza Gardens (Flower 1932); Giza, 30 July 1901: 2 fa (Flower 1932); Gizeh, Great Pyramid (Allen 1939); Giza (Sanborn & Hoogstraal 1955); Giza Governorate, inds. (Madkour et al. 1982); Zoological Gardens, inds. (Hafez et al. 1977, 1984); Giza, 10 inds., BMNH, HZM (Qumsiyeh 1985); Pyramids of Giza, obs. 1 ind. (Qumsiyeh 1985); Giza Governorate, coll. inds. (Ramadan 1986); Giza, 27 May 1953: 1 ma, 1 fa, FMNH, 4 inds., BMNH (Bergmans 1994); Giza province, inds. (Fayed et al. 2011); Giza, old abandoned house, January–May 2018: net. 10 inds. (Sheta & Behary 2019); Giza, coll. 20 ma (Taha & Soliman 2019); – 1 km SE El Manashi [29], 3 inds., CMNH (Qumsiyeh 1985); – El Mansuriya [30], May 1951: 1 ind. (Rudnick 1960); El Mansuriya, inds. (Hafez et al. 1977, 1984); El Mansuriya, 2 inds., FMNH (Qumsiyeh 1985); El Mansuriya, 28 May 1951: 1 fa, 1 fs, FMNH (Bergmans 1994); El Mansoria, inds. (Kandeil et al. 2020); – Imbaba [31], inds. (Hafez et al. 1977, 1984). – El Minia: Minia [32], 1 fj (Anderson 1902); – El Monufia: Al Khatatbah [33], inds. (Kandeil et al. 2020); – Menofia [34], old abandoned house, January–May 2018: net. 10 inds. (Sheta & Behary 2019); – shebin El-Kom [35], 1 ind. (Abo-Taka 1994). – El Qahira: [Cairo,] Abbasia [36], January 1956: 1 m, January 1984: 1 m, ASUC (Wassif et al. 1984); Cairo, Abbassia, 1975: 1 m, ZMA (Bergmans 1994); – Cairo [37], Old Mosque, 2 ma, 2 fa (Anderson 1902); Cairo, 2 ma, 2 fa, 1 ind., BMNH (Andersen 1912a); Kairo, Garden des Hôtel du Nil, an Bananenblüten (Becker 1903); Cairo (Flower 1932); Cairo, Citadel area, huge halls supporting Mohammed Ali Mosque, common (Hoogstraal 1952); Cairo, Citadel area, large hall under Mohammed Ali Mosque, 9 May 1951: obs. / coll. inds. (Hoogstraal 1953); Cairo (Sanborn & Hoogstraal 1955); Kairo, hohe Gewölbe unter einer alten Moschee, August–November 1954: obs. a colony of several hundred inds. (Kulzer 1958); Kairo, 1954: 2 inds., 11 May 1959: 3 ma, 8 fa, ZFMK (Eisentraut 1959); Cairo, 15 May 1951: 1 ind. (Rudnick 1960); Cairo, Citadel, 12 January 1954: inds. (Rudnick 1960); Cairo, 15 May 1951: 1 ind. (Maa 1961); Cairo (Hoogstraal 1962); Kairo (Kulzer 1963); Kairo, March, 1 ind. (Hürka 1964); Kairo, 1 m, ZFMK (von Lehmann 1964); Kairo, 10 inds., ZFMK (von Lehmann 1966); Cairo, Citadel, inds. (Sonenshine et al. 1966); Cairo, 1 ind. (Theodor 1967); Kairo, 20 inds., SMF, ZFMK (Kock 1969); Cairo, Sultan Hamid Mosque, 23 April 1969: obs. a colony of some 1000 inds., coll. 8 m, 11 f, IVB (Gaisler et al. 1972); Cairo, June 1971: 2 f, MUB (Gaisler et al. 1972); Cairo, Sultan Hassan Mosque, a colony (Madkour 1975); Cairo, Sultan Hassan Mosque, coll. 147 m (Madkour 1976a); Cairo, Sultan Hassan Mosque and the ruins neighbouring in the Central Eastern part of Cairo, colonies (Madkour 1976c); Cairo Citadel & Sultan Hassan Mosque, inds. (Hafez et al. 1977, 1984); Cairo, Sultan Hassan Mosque and different ruins neighbouring Mohammad Ali Mosque (Madkour 1977a, b); Cairo, Sultan Hassan Mosque, 15 June 1974: a colony of more than 1000 inds., coll. 2 ma, 46 fa, 8 inds., 12 January 1975: coll. 10 inds. (Madkour 1977b); Cairo, 23 April 1969: 1 ma, 1 fa, IVB (Gaisler & Baruš 1978); Cairo Province (Madkour 1978); Cairo, 10 July 1963: 18 inds., SMF (Kock & Nader 1979); Cairo, 4 inds., FMNH (DeBlase 1980); neighbourhood of Cairo, inds. (Madkour et al. 1982); Cairo, Citadel, 21 inds., November 1942: 2 inds., May 1951: 1 m, February 1953: 1 m, ASUC (Wassif et al. 1984); Kairo, 10 inds. (Hubert 1985); Cairo, 65 inds., BMNH, FMNH, USNM (Qumsiyeh 1985); Old City of Cairo, coll. inds. (Ramadan 1986); near Cairo, inds. (Condò et al. 1989); Cairo, 2 February 1984: coll. inds. (Klompén 1992); Cairo, Citadel, 20 August–2 October 1952: 4 ma, 2 ms, 3 fa, 1 fs, 1 ind., FMNH (Bergmans 1994); Cairo, Mohammed Ali Mosque, 3 May 1951: 1 ma, 1 fa, FMNH (Bergmans 1994); Cairo, Sultan Hassan Mosque, 22 June 1959: 4 ma, 2 ms, 2 fa, 1 ind., FMNH, 1 ma, 1 fa, FMNH, 10 July 1963: 5 m, 14 f, SMF, 7 January 1984: 2 ma, 1 ma, 3 fa, 1 fs, ZMA (Bergmans 1994); Cairo, 1888: 1 ms, ZMH, 10 July 1931: 1 fa, 6 inds., SMF, 3 ind., BMNH, 1 ind., USNM (Bergmans 1994); Cairo region, 6 June 1880: 1 ma, NMW (Bergmans 1994); Cairo, Sultan Hassan mosque in Al-Kalaa Citadel, coll. 5 m, 4 f (El-Dawy & Ibrahim 1994); Cairo, Sultan Hamid Mosque, 23 April 1969 & June 1971: 8 m, 6 f, 1 ind., IVB, MUB (Benda et al. 2006, 2012a, Van Damme et al. 2018); Cairo, Sultan Hassan Mosque, 11 May 1951: 3 m, 7 f, ZFMK (Benda et al. 2006, 2012a, Van Damme et al. 2018); El Qahirah, Muqattam, old

quarries, 28–29 January 2010: obs. 1 ind. (Benda et al. 2011a); Cairo, 23 September 1966: 1 ind., YPM (Dornburg et al. 2011); El-Soultan Hassan regions, 40 inds. (Rizk & Eissa 2013); – [Cairo,] El Khalig [38], inds. (Hafez et al. 1977, 1984); – [Cairo,] El Manyal [39], inds. (Hafez et al. 1977, 1984); – Cairo, Gezira Island [40], 2 m, 5 f, USNM (Setzer 1952); Cairo, El Zamalik, 10 March, 13 March & 14 March 1964: obs. inds., central cave of the Nile Aquarium, obs. a colony (Kaisila 1966); Cairo, Gezira Island, inds. (Sonenshine et al. 1966); Gezira-Island, inds. (Hafez et al. 1977, 1984); El Gezira, 1 ind., USNM (Qumsiyeh 1985); the aquarium (El Asmak garden), coll. 20 inds. (Morsy et al. 1986a); “El Asmak garden” (= The Aquarium garden), El Zamalek, coll. 20 inds. (Morsy et al. 1986b); Gezira Island, 1 ind., USNM (Bergmans 1994); El Qahirah, Zamalek, Fish Garden, artificial cave, 22 September 2005: obs. 2 inds., 28 January 2010: obs. a colony of ca. 30 inds., net. 6 inds., 18 November 2010: obs. a colony of ca. 120 inds., 16 December 2010: obs. a colony of ca. 650 inds., 14 January 2011: obs. a colony of ca. 500 inds. (Benda et al. 2011a, 2012a); El Qahirah, 6 inds. (Hulva et al. 2012); – Maadi [41], 1 ind., BMNH (Qumsiyeh 1985); Cairo, Maade, BMNH (Bergmans 1994); – Mataria [42], June 1939: 1 f, ASUC (Wassif et al. 1984). – E l Q a l y u b i y a h: Ain Shams University [43], old building, coll. inds. (Hafez et al. 1994); – Banha [44], inds. (Kandeil et al. 2020); – Barshum el Kubra (Tukh) [45], inds. (Hafez et al. 1977); – Delta Barrage Gardens [46] (Flower 1932); Qaliobia Governorate, coll. inds. (Eissa & Yassin 2015); – El Qalag (El-Khanka) [47], inds. (Hafez et al. 1977). – E l U q s u r: near Luxor [48], 21 March 1938: inds. (Rudnick 1960); Luxor, 26 April to 3 May 1969: obs. foraging inds. (Gaisler et al. 1972); Karnak temple complex, April–May 1969: obs. inds. (Gaisler et

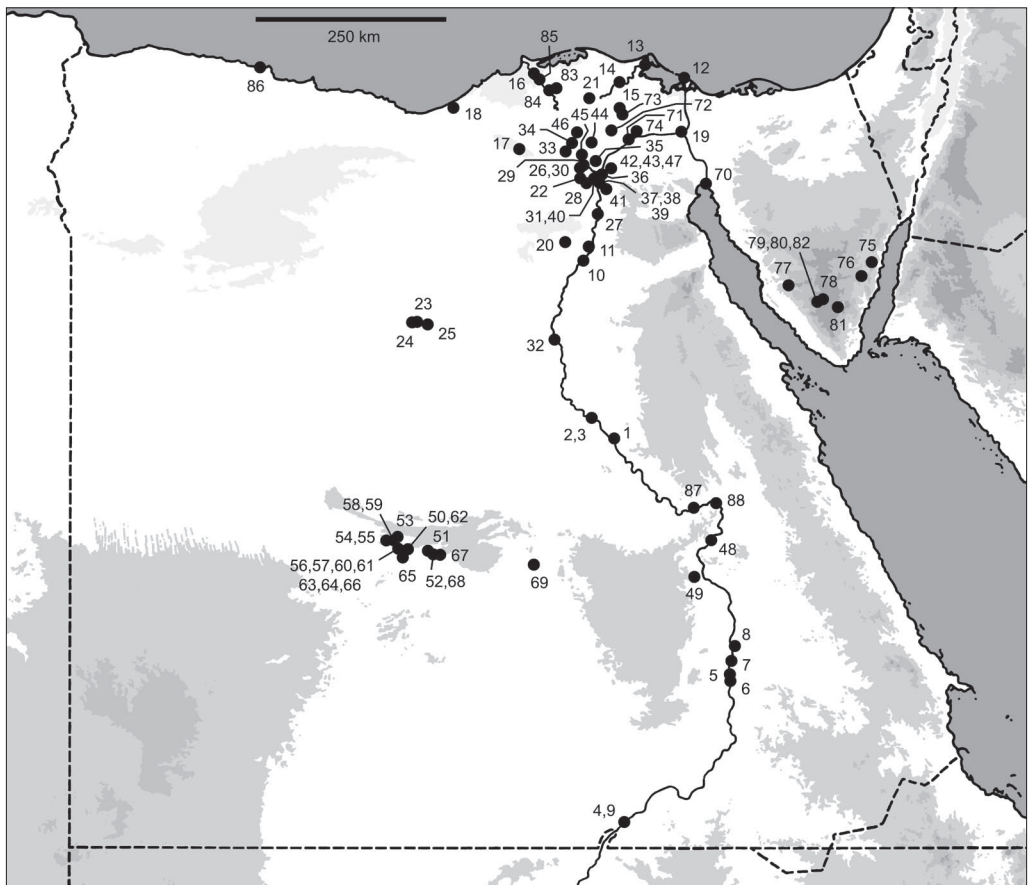


Fig. 3. Records of *Rousettus aegyptiacus* (Geoffroy, 1810) in Egypt; pale grey – depressions beneath 0 m a. s. l.; medium grey – areas above 400 m a. s. l.; dark grey – areas above 800 m a. s. l.; gloomy grey – areas above 1,200 m a. s. l.

al. 1972); Luxor, inds. (Hafez et al. 1977, 1984); Kurna, inds. (Hafez et al. 1977, 1984); Luxor, 18 inds., FMNH (Qumsiyeh 1985); Nr. Luxor (Kurna and Grand Hotel ruins), 21–26 March 1938: 8 ma, 1 fa, 1 ind., FMNH (Bergmans 1994); Thebes, 1 m, 1 f, IMC (Ghosh 2005); El Uqsur, El Karnak Temple, 27 January 2010 & 8 December 2011: obs. feeding traces (Benda et al. 2011a); El Uqsur, El Gazera, lake, 12 January 2011: net. 10 inds. (Benda et al. 2011a); El Uqsur, Luxor Temple, Mosque of Abu El Haggag, 7 December 2011: obs. 5 inds. (Benda et al. 2011a); Luxor, Gardens of Winter Palace hotel, and Jolie Ville [hotel], 20–30 September 2017: obs. inds. (Pitt 2017); – Wadi Nassim [49], inds. (Hafez et al. 1977, 1984); Wadi Nassim, 1 ind., USNM (Qumsiyeh 1985). – E l W a d i E l J a d i d : [Dakhla Oasis,] Asmant [50], inds. (Hafez et al. 1984); Dakhla Oasis, Ismant, abandoned house, 2010–2011: a roost (Benda et al. 2011a); – Dakhla Oasis, Balat [51], old abandoned house, 2010–2011: a roost (Benda et al. 2011a); – Dakhleh Oasis, Bashendi [52], 1989 & 1990: obs. foraging inds. (Churcher 1991); Dakhla Oasis, Bashendi, mosque, 22 January 2010: obs. feeding traces (Benda et al. 2011a); – Dakhla Oasis, Bir El Gabal [53], abandoned house, 2010–2011: a roost (Benda et al. 2011a); – Dakhla Oasis, Bir El Nokta [54], abandoned house, 2010–2011: a roost (Benda et al. 2011a); – Dakhla Oasis, Bir el Wastani [55], abandoned house, 2010–2011: a roost (Benda et al. 2011a); – Dakhla Oasis, Budukhla [56], abandoned house, 2010–2011: a roost (Benda et al. 2011a); – Dakhla Oasis, El Awaina [57], tombs, 2010–2011: a roost (Benda et al. 2011a); – Dakhleh Oasis, El Q'asr [58], 1989 & 1990: obs. two colonies & foraging inds.; Q'asr, deserted building, 12 February 1990: obs. a colony of 50–100 inds., coll. 2 m, ROM (Churcher 1991); Dakhla Oasis, El Qasr, medina, abandoned house, 17 April 2002: obs. a colony, coll. 1 mj, 1 fa, 4 inds., NMP, 20–21 January 2010: obs. a colony of ca. 1200 inds., net. 54 inds., NMP (Benda et al. 2006, 2007, 2008, 2011a, 2012a, Van Damme et al. 2018); El Qasr, medina, 14 sites in abandoned houses, 2010–2011: roosts (Benda et al. 2011a); El Qasr, abandoned house in a palm garden, 2010–2011: a roost (Benda et al. 2011a); Dakhla, El Qasr, 45 inds. (Hulva et al. 2012); Dakhla, El Qasr, old town, colonies (Bachorec et al. 2020a, b, cf. Lučan et al. 2014); Dakhla oasis, 2014–2018: obs. inds. in roosts (Mohallal & Ahmed 2018); – Dakhla Oasis, Ezab El Qasr [59], roofed street underpass, 2010–2011: a roost (Benda et al. 2011a); Ezab El Qasr (Giza), house ruin, 2010–2011: a roost (Benda et al. 2011a); – Dakhla Oasis, Gedida [60], stable, onion storage, 2010–2011: a roost (Benda et al. 2011a); Gedida, ruin, 2010–2011: a roost (Benda et al. 2011a); Gedida, abandoned house, 2010–2011: a roost (Benda et al. 2011a); – Dakhla Oasis, Gharghur [61], tombs, 2010–2011: a roost (Benda et al. 2011a); Gharghur, ruin at a mosque, 2010–2011: a roost (Benda et al. 2011a); – Dakhla Oasis, Hindaw [62], abandoned house, 2010–2011: a roost (Benda et al. 2011a); – Dakhla Oasis, Kalamoun [63], abandoned house, 2010–2011: a roost (Benda et al. 2011a); Dakhla, Qualamun, 1 ind. (Horáček et al. 2013); – Dakhla Oasis, Mushyie [64], abandoned house, 2010–2011: a roost (Benda et al. 2011a); – Dakhla Oasis, Mut [65], medina, ruin of an abandoned house, 21 January 2010: obs. a colony of ca. 260 inds. (Benda et al. 2011a); Dakhla, Mut, 10 inds. (Hulva et al. 2012); – Dakhla Oasis, Rashda [66], abandoned house, 2010–2011: a roost (Benda et al. 2011a); – [Dakhla Oasis], Tenaída [67], inds. (Hafez et al. 1984); – Dakhla Oasis, Zakhir [68], ruin of an abandoned house, 2010–2011: a roost (Benda et al. 2011a); – El Kharga Oasis, El Kharga [69], palm garden at the S edge of the town, 23 January 2010: net. 27 inds. (Benda et al. 2011a); El Kharga, 17 inds. (Hulva et al. 2012); Kharga oasis, 2014–2018: obs. inds. in roosts (Mohallal & Ahmed 2018). – E s S u w a i s : Suez [70], Mohamed Ali's palace, large numbers (Bakr & Abd El Hafez 2012). – E s h S h a r q i y a h : El Tahawiya (Bilbis) [71], inds. (Hafez et al. 1977); – El Zankalun (Zagazig) [72], inds. (Hafez et al. 1977); – Negoom [73], June 1917 (Flower 1932); – Tel el Kebir [74], small open stable or shed, 10 January 1912: several hundred inds. (Flower 1932). – J a n u b S i n a ' : Ain El Furtaga [75], above a pool in a canyon above the oasis, 16 September 2005: net. 5 ma, 2 fa, 2 fj, NMP, 17 September 2005: net. 4 ma, 2 fa, 1 fj (Benda et al. 2008, 2010, 2011a, 2012a); Ain El Furtaga, 1 ind. (Hulva et al. 2012, Centeno-Cuadros et al. 2017); – Ein Hodra Oasis [76], Wadi Hodra, at a well, 4 August 2005: net 1 fa (Dietz 2005b, Dietz & Maltby 2006); Ein Hodra Oasis, Wadi Hodra, 4 August 2005: obs. 5 inds. (Dietz 2005b, Dietz & Maltby 2006); Ain Hudra, oasis, 4 August 2005: net. 5 fa, obs. 5 inds., 14 September 2005: net. 1 ma, NMP (Benda et al. 2008); Ain Hudra, 14 September 2005: 1 ma, NMP (Benda et al. 2010, 2011a, 2012a, Hulva et al. 2012, Centeno-Cuadros et al. 2017); – Feiran Oasis [77], Wadi Feiran, garden el Braga, 10 August 2005: net. 8 fa, 6 fs, 17 ma, 5 ms, 30 inds., 11 August 2005: obs. 3 inds., 12 August 2005: obs. 3–5 inds. (Dietz 2005b, Dietz & Maltby 2006); Feiran, garden, 10 August 2005: net. 17 ma, 5 ms, 8 fa, 6 fs, 30 inds., 11 August 2005: obs. 3 inds., 12 August 2005: obs. 3–5 inds., 10 September 2005: net. 7 ma, 1 mj, 14 fa, 11 fj/s, NMP (Benda et al. 2007, 2008, 2010, 2011a, 2012a); Feiran, above a pool in western edge of the oasis, 8 September 2005: net. 1 fj, NMP (Benda et al. 2008, 2011a); Wadi El Feiran, 2 inds. (Hulva et al. 2012, Centeno-Cuadros et al. 2017); Wadi Feiran, Breyga garden, 10 July 2011: net. 1 ind. (Foui 2011); – St. Katherine village [78], trees along the road, 9 August 2005: obs. & rec. 1 ind. (Dietz 2005b, Dietz & Maltby 2006); St. Katrina village & surrounds, between Wadi Arbain (Moses Rock) and Fox Camp, 1 July 2007: det. calls (Truscott 2007); El Milga, village, trees along the road, 9 August 2005: det. & rec. 1 ind. (Benda et al. 2008); El Milga, between Wadi El Arbaein (Moses' Rock) and the Fox Camp, 1 July 2007: det. & rec. min. 1 ind. (Benda et al. 2008); – Wadi Itfah [79], Hamid's Garden, 3 August 2006: net. 3 fj (Benda et al. 2008); – Wadi Klar [80], Hamid's Garden, 1 August 2006: net. 3 fj (Dietz & Maltby 2006, Benda et al. 2008); – Wadi Nasb [81], camp site, 26 July 2011: net. 1 ind. (Foui 2011); Wadi Nasb, animal pool, 27 July 2011: net. 2 inds. (Foui 2011); – Wadi Shagg [82], Oder's Garden, 27 July 2006: net. 1 fa (Dietz & Maltby 2006, Benda et al. 2008). – K a f r E s h S h e i k h : Beltim, Delta*, 1 ma, 1 fa (Anderson 1902); – El Malaheen [83], Desouk, tombs, 8 March 2010: obs. 5 inds. (Benda et al. 2011a); – El Sawaqi [84], Desouk, agricultural areas, 7 March 2010: obs.

2 inds. (Benda et al. 2011a); – F u a h [85], around trees, 23 October 1849: obs. & coll. inds. (Brehm 1855). – M a t r u h: Mersa Matruh [86], 7 February 1920: 1 ind. (Flower 1932). – Q e n a: Nag Hammadi [87], 16 km south of Nag Hammadi on eastern bank of the Nile, 4 January 1964: 6 inds., YPM (Dornburg et al. 2011); – Qena [88] (Sanborn & Hoogstraal 1955).

IMPRECISE RECORDS. toute l’Égypte (Geoffroy 1818, 1828); Égypte (Desmarest 1820); Aegypt, 1 ind., ZMB (Lichtenstein 1823); Égypte (Temminck 1825 [as *Pteropus Geoffroyi*]); In Aegyptio (Fischer 1829); Égypte (Lesson 1834 [as *Pteropus Geoffroyi*]); Egypt (Presl 1834); Egypt, 2 inds., BMNH (Anonymous 1839); Egypten (Wagner 1840 [as *Pteropus Geoffroyi*]); Aegypten, 5 inds., SMF (Rüppell 1842b [as *Pteropus Geoffroyi*]); Egypt, 2 m, 2 f, 2 inds., BMNH (Gray 1843); Egypt, inds., BMNH (Gray 1848); Égypte (Gervais 1854); Aegypten (Wagner 1855 [as *Pteropus Geoffroyi*]); Ägypten (Frauenfeld 1857); Aegypten (Kolenati 1857a, 1858b); Egypt, 1 ma, 3 fa, 2 inds., BMNH (Dobson 1878); Ägypten (Kolenati 1859a, b, 1860b); Egypt, 1 ind., BMNH (Gray 1862); Ägypten (Fitzinger & von Heuglin 1866); Aegypten, in Ruinen der Tempel, in Moscheen und Sékh-Gräbern (Hartmann 1868); Ägypten (Peters 1868, Fitzinger 1869a); Egypt (Gray 1870); Egypten (Brehm 1876); Egypten (von Heuglin 1877 [as *Pteropus Geoffroyi*]); Egypt (Dobson 1878); Égypte (Trouessart 1879); Aegypten, 1 ind., KLHB (Nehring 1886); Égypte, 3 inds., RNHL (Jentink 1887); Égypte, 4 inds., RNHL (Jentink 1888); Aegypten, 1 m, ZMH (Noack 1891); Aegypten, 2 m, 3 f, ZMB (Matschie 1899); Aegypten, inds., ZMB (Speiser 1901); Ägyptus (Trouessart 1904); Aegyptus (Bezzi 1905); Lower Egypt (Andersen 1907); Egypt, 2 fa, 5 inds., BMNH (Andersen 1912a); Egypt (Kessel 1925, Jobling 1934); Égypte, 1 f, MNHN (Rode 1941); Aegyptus (Theodor 1954); Egypt (Hoogstraal 1955, Theodor 1955, Hoogstraal 1956); Ägypten, 1954: obs. inds. (Kulzer 1956, Möhres & Kulzer 1956a); Egypt, 4 inds. (Wells & Randall 1956); Egypt (Theodor 1957); Ägypten, SMF, SMNS, ZFMK (Eisentraut 1959); Égypte (Fain 1963); Egypt, coll. inds. (El Sabban et al. 1967); Egypt, 4 inds. (DeBlase 1972a); Egypt, 18 inds. (Baruš 1973); Egypt (Madkour 1976b); Egypt, 1972–1975: 108 inds. (Saoud & Ramadan 1976b); Egypt, Nile Valley (Wassif 1976); A. R. Egypt, inds. (Madkour 1977c); Ägypten, ohne näheren Fundort, before 1880: 3 m, 5 f, NMW (Spitzenberger 1979); Egypt (Blackwell 1980); Egypt, 10 fa (Shehata 1983); Egypt, 5 inds., BMNH, SMNS (Qumsiyeh 1985); Egypt, 1963: 1–2 inds. (Uchikawa 1986); Egypt, 1829: 1 ma, 1851: 1 ma, SMNS, 1 June 1852: small series of inds., NMW, 3 inds., MNHN, 6 inds., BMNH, 1 fa, 4 inds., RNHL, 5 inds., SMF, 1 fa, 3 inds., ZMB (Bergmans 1994); Egypt, inds. (Al-Bassel & Ashour 1999); Egypt, 10 m, 13 f (Riad et al. 2000); Egypt, 2 inds., 17 August 1994: 2 m, 2 f, ZFMK (Benda et al. 2006, 2012a, Van Damme et al. 2018); Egypt, 1 ind. (Han et al. 2010); Egypt, 10 inds., YPM (Dornburg et al. 2011); Egypt, February 2013–April 2015: coll. 257 inds. (Shehata et al. 2016); Egypt, 2016–2017: 473 inds. (Kandeil et al. 2019). – [Nile] Delta, nich selten (Brehm 1864); im Delta keineswegs selten ist (Brehm 1876); Nil-Tal, 1955 (Kulzer 1966); Nile Delta region, March 2017: 82 inds. (Kandeil et al. 2019). – Nubie (Gervais 1854); Nubien (Hartmann 1863, 1868, Brehm 1876, Nehring 1886, Matschie 1899). – vicinity of Cairo [36–42] and Giza [22–31] Province, October 1959 – October 1961: 42 inds. (Mohammed & Saoud 1965). – Giza [22–31] and/or Damietta [14] Governorates, May–October 2016: net. 288 inds. (El Taweel et al. 2020). – Cairo [36–42], El Fayum [20] and Giza [22–31] governorates, 20 inds. (Morsy et al. 1987b).

DISTRIBUTION. *Rousettus aegyptiacus* is a very common bat in Egypt, it has been documented from 88 localities (Fig. 3) and represents the most frequent bat species of the country; it was found in all geographic regions of Egypt (Table 2). Considering the number of reported localities, *R. aegyptiacus* is the most frequent bat species in the Western Desert, Cairo Region, and Nile Delta. It is also a very common bat of the Nile Valley, which is occupied by this bat in its whole length in Egypt; it is the fourth most common bat species there (Table 2).

The Egyptian records of *R. aegyptiacus* are available from a very wide altitude range of –10–1890 m a. s. l. (median 65.5 m, mean 171.2 m; Fig. 4, Table 3). However, the localities in the continental African part of Egypt lie in a very narrow range of lowland altitudes (–10–190 m a. s. l.; median 32.5 m, mean 61.1 m), while the Sinaitic records come from a very wide altitude range of 240–1890 m a. s. l. (median 987.5 m, mean 1051.5 m; Fig. 5, Table 4). Thus, the continental and Sinaitic altitude ranges do not overlap and represent two separate distribution types in the lowland and mountainous zones.

Due to its special trophic requirements, *R. aegyptiacus* could be found only in localities with sufficient intensity of fruit production, i.e., in well established farmland spots. The present review shows these spots to be distributed over most of the Egyptian territory, where gardening is carried

* NOTE. The location of these two specimens originally labelled as coming from Belim, Delta (Anderson 1902), was corrected by Flower (1932: 377), who state them as of unknown origin in fact and being purchased probably in Cairo. This correction was ignored by Qumsiyeh (1985: 15), Basuony (2003), and Hoath (2003) who considered the Anderson’s (1902) locality affiliation valid.

Table 2. Review of records of particular of bat species in particular geographical regions of Egypt

species species	Western Desert	Nile Valley	Mediterr. Shore	Cairo Region	Nile Delta	Red Sea Shore & Mts.	Sinai	total
<i>Rousettus aegyptiacus</i>	24	18	3	15	19	1	8	88
<i>Rhinopoma microphyllum</i>	–	5	–	7	–	–	–	12
<i>Rhinopoma cystops</i>	1	23	–	11	–	1	4	40
<i>Rhinolophus clivosus</i>	1	7	1	10	–	3	5	27
<i>Rhinolophus hipposideros</i>	–	–	–	–	–	–	6–7	6–7
<i>Rhinolophus mehelyi</i>	–	1	3	3	–	–	0–1	7–8
<i>Asellia tridens</i>	15	19	–	11	–	3	3	52
<i>Taphozous perforatus</i>	1	12	–	8	3	2	1	27
<i>Taphozous nudiventris</i>	11	9	–	6	2	1	–	29
<i>Nycteris thebaica</i>	1	14	1	8	6	–	2	32
<i>Eptesicus bottae</i>	–	1	–	3	–	2	5	11
<i>Hypsugo ariel</i>	–	1	–	–	–	2	13	16
<i>Pipistrellus kuhlii</i>	18	19	9	12	15	2	3	78
<i>Vansonia rueppellii</i>	3	2	–	3	–	3	–	11
<i>Nycticeinops schlieffenii</i>	–	–	–	1	–	1	–	2
<i>Otonycteris hemprichii</i>	3	5	1	10	–	1	4	24
<i>Barbastella leucomelas</i>	–	[1]	–	–	–	–	8	8
<i>Plecotus christii</i>	4	6	–	6	–	2	15	33
<i>Tadarida teniotis</i>	1	–	–	5	–	–	7	13
<i>Nyctinomus aegyptiacus</i>	–	2	–	2	–	4	–	8
no. species	12	16	6	17	5	14	15	20
no. records	83	144	18	121	45	28	86	526
no. records per species	6.9	9.0	3.0	7.1	9.0	2.0	5.7	26.3

out. In comparison with the picture given by Qumsiyeh (1985), the occurrence of *R. aegyptiacus* is here presented additionally from the oases in the Western (Libyan) Desert and Sinai. In the Western Desert this bat was previously reported only from Wadi El Natrun (Hoogstraal 1962); now it has been documented from all large western oases (Bahariya, Dakhla, Kharga) except Siwa, the oasis most remote and isolated from the main Egyptian range of *R. aegyptiacus* situated along the Nile. In the Bahariya and Dakhla Oases, *R. aegyptiacus* was discovered in the early 1980s (Hafez et al. 1984, Churcher 1991), in the Kharga Oasis in 2010 (Benda et al. 2011a). Relatively abundant occurrence of *R. aegyptiacus* in the mountains of southern Sinai was documented during several research trips in 2005–2011 (Benda et al. 2008, Foui 2011).

A question remains, whether the populations of *R. aegyptiacus* inhabiting the arid areas situated west and east of the Nile, the Western Oases and Sinai, were overlooked for a long time and just recently discovered, or whether they are a result of a recent expansion of the range, connected with intensive cultivations of the concerned areas. Benda et al. (2008, 2010), Hulva et al. (2012) and Centeno-Cuadros et al. (2017) demonstrated a close similarity of the Sinaitic bats to those of the southern Holy Land, suggesting that the Sinaitic populations derived from the populations of southern Levant or north-western Arabia as well, rather than from the populations of the continental part of Egypt. On the other hand, the bats of the Western Oases were shown to be most similar to the bats of the Nile regions of Egypt (Benda et al. 2012a, Hulva et al. 2012). However, these findings concerning morphological and genetic characters of the arid-dwelling populations of *R. aegyptiacus* do not answer the age of their occurrence spots, since all populations of the Middle East including Egypt are very similar concerning their genetic traits (Benda et al. 2012a, Hulva et al. 2012, Stribna et al. 2019). These similarities indicate rather recent gene exchanges

between particular populations and thus, such results do not allow to hypothesise about directions and time of spreading of these populations. However, Zelenova & Yosef (2003) suggested a recent (just before 2002) invasion of *R. aegyptiacus* to the arid parts of southern Israel from the Mediterranean habitats in the north of the country. The Sinaitic populations, discovered in 2005, could be a consequence of such recent invasion.

Several authors of the 19th century (Gervais 1854, Hartmann 1863, 1868, Brehm 1876, Nehring 1886, Matschie 1899) reported Nubia as a part of the distribution range of *R. aegyptiacus* in Africa. However, at the beginning of the 20th century, no specific record of this bat was available from Nubia, i.e., from the region of the Nile between the First Cataract of the Nile (at Aswan) in southern Egypt and the Sixth Cataract in the central Sudan. Anderson (1902) and Andersen (1912a) reported Asyut in northern Upper Egypt (ca. 390 km south of Cairo along the Nile) as the southernmost locality of *R. aegyptiacus* in Egypt at the turn of the centuries. Flower (1932: 377) summed up his view of the Nubian occurrence of this bat at that time as follows: “I have no notes of *Rousettus aegyptiacus* from any part of Nubia. In the Dongola Province [of the northern Sudan] fruit-bats appear to be unknown. At Khartoum, however, and south along the Blue Nile, fruit-bats are numerous, and make themselves disliked by the noise they make at night in the gardens; these Sudan bats do not belong to *Rousettus*, but to the genus *Eidolon*.” So, the oldest mentions of *R. aegyptiacus* from the areas adjacent to the present border between Egypt and the

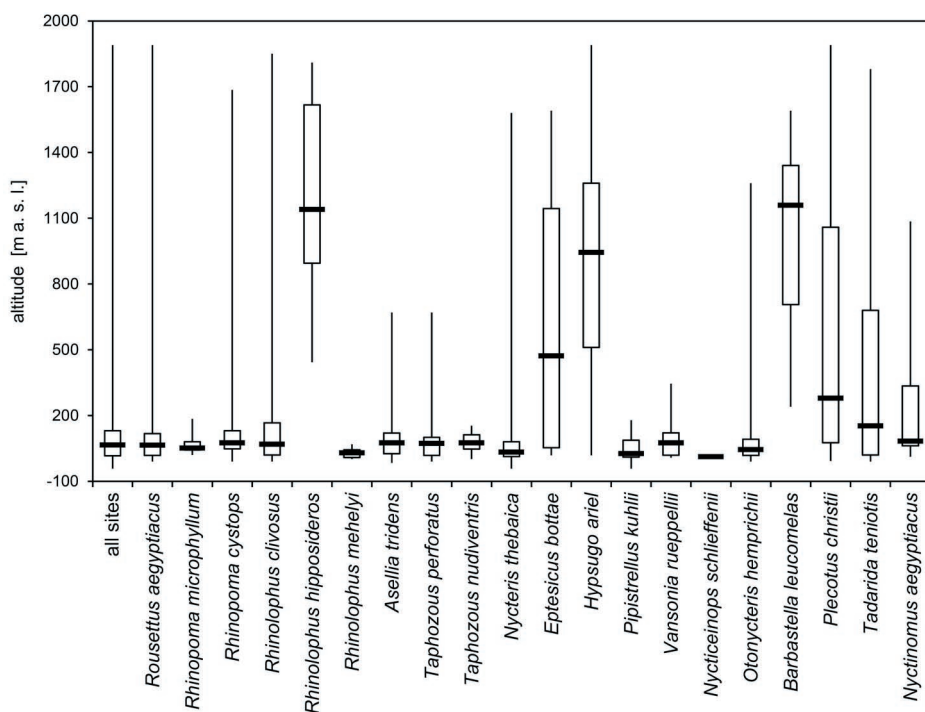


Fig. 4. Altitudinal distribution of particular bat species in Egypt (see also Table 3); the boxes represent the range of the first and third quartiles; the vertical lines represent the range of minimum and maximum values; horizontal bold lines represent medians.

Table 3. Altitudinal distribution of particular bat species in Egypt; in metres above sea level

species	n	min	max	range	median	mean
<i>Rousettus aegyptiacus</i>	88	−10	1890	1900	65.5	171.2
<i>Rhinopoma microphyllum</i>	12	20	185	165	52.5	71.4
<i>Rhinopoma cystops</i>	40	−10	1685	1695	76.0	189.3
<i>Rhinolophus clivosus</i>	27	−10	1850	1860	70.0	274.7
<i>Rhinolophus hipposideros</i>	6	443	1810	1367	1140.0	1202.6
<i>Rhinolophus mehelyi</i>	7	1	69	68	30.0	29.1
<i>Asellia tridens</i>	51	−16	670	686	76.0	98.8
<i>Taphozous perforatus</i>	27	−10	670	680	73.0	91.5
<i>Taphozous nudiventris</i>	29	1	153	152	76.0	76.7
<i>Nycteris thebaica</i>	32	−42	1580	1622	34.0	115.6
<i>Eptesicus bottae</i>	11	18	1590	1572	472.5	620.3
<i>Hypsugo ariel</i>	16	18	1890	1872	945.0	886.3
<i>Pipistrellus kuhlii</i>	78	−42	179	221	27.0	47.0
<i>Vansonia rueppellii</i>	11	8	345	337	76.0	94.2
<i>Nycticeinops schlieffenii</i>	2	5	20	15	12.5	12.5
<i>Otonycteris hemprichii</i>	24	−10	1260	1270	45.0	189.0
<i>Barbastella leucomelas</i>	8	240	1590	1350	1160.0	1048.1
<i>Plecotus christii</i>	33	−7	1890	1897	280.0	568.7
<i>Tadarida teniotis</i>	13	−10	1780	1790	153.0	484.8
<i>Nyctinomus aegyptiacus</i>	8	12	1085	1073	84.0	300.9
all sites	221	−42	1890	1932	66.0	241.5

Sudan could perhaps represent *Eidolon helvum* (Kerr, 1782) instead of *Rousettus* Gray, 1821. On the other hand, in the 19th century, *E. helvum* was commonly distributed only in the areas south of Khartoum, while in Khartoum per se it was documented first in 1902 (Thomas 1903a). At that time, the cultivation of land in the city founded several tens of years ago allowed to feed a population of this large fruit bat (Kock 1969), but, no particular record is available from the region north of Khartoum†. Maybe, the old mentions of *R. aegyptiacus* from Nubia were caused just by rather vague geographical definitions of particular regions of north-eastern Africa in the distribution range descriptions, and no species of fruit bat was actually ever recorded from Nubia until the 20th century (although before complete desertification of the Sahara this bat was perhaps distributed across its savannah habitats like in the present sub-Saharan range).

Nevertheless, during the 20th century, *R. aegyptiacus* was documented in the southern parts of Upper Egypt and finally, also in Nubia per se. In the late 1930s, it was found at Luxor, ca. 320 km south of Asyut along the Nile (Rudnick 1960), in the late 1940s in Aswan at the northern border of Nubia, ca. 350 km south of Luxor (Wassif et al. 1984), and in the early 1960s at Abu Simbel in southern Lower Nubia, ca. 290 km south of Aswan along the Nile (Bergmans 1994, Dornburg et al. 2011). At the same time when *R. aegyptiacus* was first collected at Abu Simbel, it was also found some 80 km to the south along the Nile, in the Second Cataract region of the northern Sudan (Kaisila 1992). Such a time course of the recorded occurrence suggests a gradual spreading of this bat to the south along the Nile between 1930 and 1970. The Nile Valley of Upper Egypt and Nubia up to Wadi Halfa always was a favourite destination for boat travellers, and namely in the first half of the 20th century. Considering the conspicuous nature of the *R. aegyptiacus* occurrence

† NOTE. Concerning the occurrence of *Eidolon helvum* in Nubia, Hartmann (1868: 40) reported as follows (under the name *Pteropus paleaceus* Peters): “In Südnubien vom 18° Br. an aufwärts”. However, Kock (1969) and Koopman (1975) did not consider this report as supported by real records of this bat.

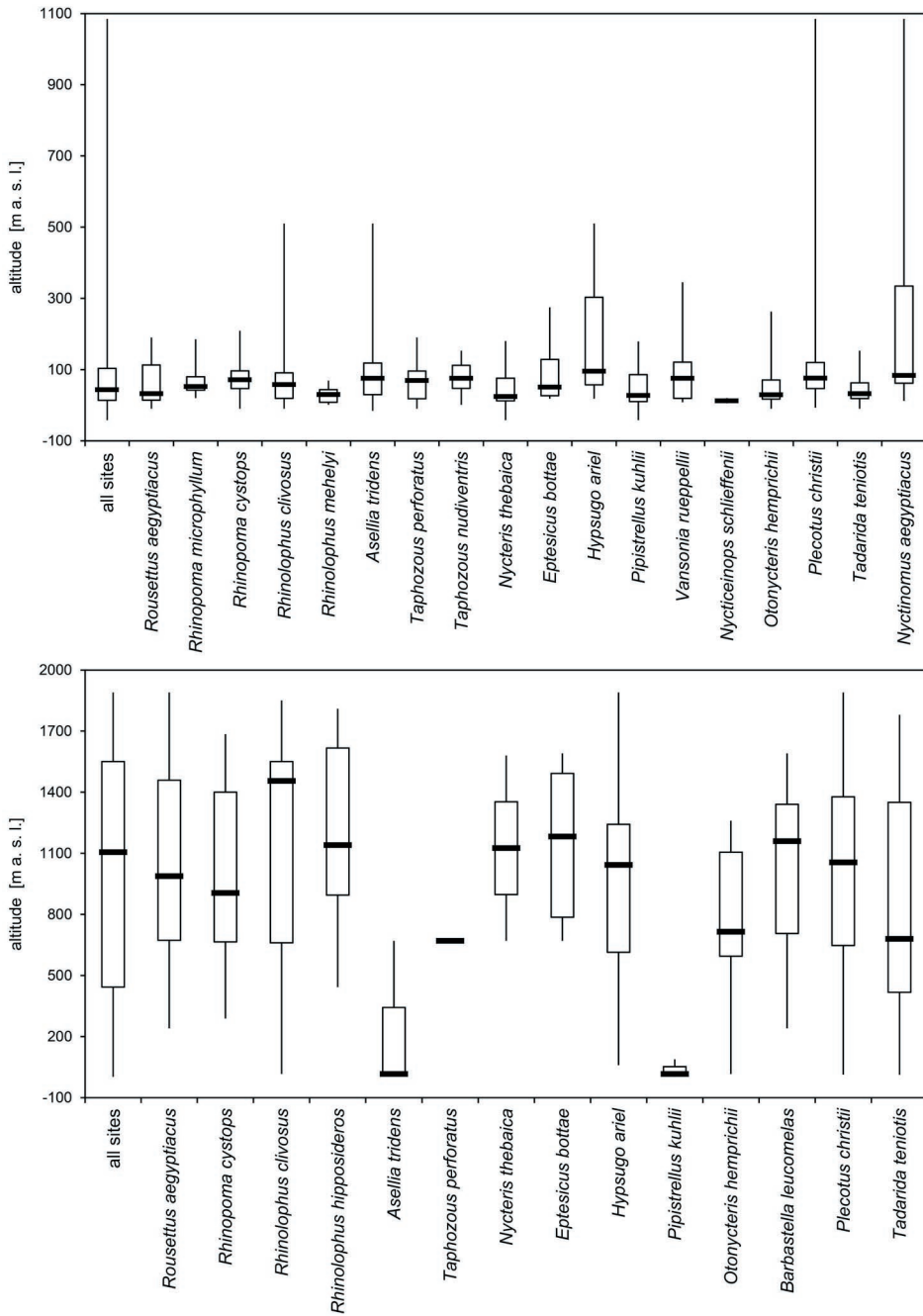


Fig. 5. Altitudinal distribution of particular bat species in the continental part of Egypt (top) and in Sinai (below; see also Table 4); for explanations see Fig. 4.

Table 4. Altitudinal distribution of particular bat species in the continental part of Egypt and in Sinai separately; in metres above sea level

species	n	min	max	range	median	mean
continental Egypt						
<i>Rousettus aegyptiacus</i>	80	−10	190	200	32.5	61.1
<i>Rhinopoma microphyllum</i>	12	20	185	165	52.5	71.4
<i>Rhinopoma cystops</i>	36	−10	209	219	72.0	78.3
<i>Rhinolophus clivosus</i>	22	−10	510	520	58.0	85.7
<i>Rhinolophus mehelyi</i>	7	1	69	68	30.0	29.1
<i>Asellia tridens</i>	48	−16	510	526	76.0	90.5
<i>Taphozous perforatus</i>	26	−10	190	200	70.0	68.4
<i>Taphozous nudiventris</i>	29	1	153	152	76.0	76.7
<i>Nycteris thebaica</i>	30	−42	180	222	24.5	48.3
<i>Eptesicus bottae</i>	6	18	275	257	51.0	94.7
<i>Hypsugo ariel</i>	3	18	510	492	96.0	208.0
<i>Pipistrellus kuhlii</i>	75	−42	179	221	27.5	47.5
<i>Vansonia rueppellii</i>	11	8	345	337	76.0	94.2
<i>Nycticeinops schlieffenii</i>	2	5	20	15	12.5	12.5
<i>Otonycteris hemprichii</i>	20	−10	263	273	29.5	51.7
<i>Plecotus christii</i>	18	−7	1085	1092	76.5	174.8
<i>Tadarida teniotis</i>	6	−10	153	163	32.5	49.2
<i>Nyctinomus aegyptiacus</i>	8	12	1085	1073	84.0	300.9
all sites	180	−42	1085	1127	43.5	74.5
Sinai						
<i>Rousettus aegyptiacus</i>	8	240	1890	1650	987.5	1051.5
<i>Rhinopoma cystops</i>	4	288	1685	1397	905.0	988.6
<i>Rhinolophus clivosus</i>	5	16	1850	1834	1455.0	1106.2
<i>Rhinolophus hipposideros</i>	6	443	1810	1367	1140.0	1202.6
<i>Asellia tridens</i>	3	13	670	657	16.0	233.0
<i>Taphozous perforatus</i>	1	670	—	0	—	—
<i>Nycteris thebaica</i>	2	670	1580	910	1125.0	1125.0
<i>Eptesicus bottae</i>	5	670	1590	920	1182.5	1145.8
<i>Hypsugo ariel</i>	13	59	1890	1831	1042.5	960.6
<i>Pipistrellus kuhlii</i>	3	3	88	85	16.0	35.7
<i>Otonycteris hemprichii</i>	4	16	1260	1244	715.0	738.2
<i>Barbastella leucomelas</i>	8	240	1590	1350	1160.0	1048.1
<i>Plecotus christii</i>	15	13	1890	1877	1055.0	1011.8
<i>Tadarida teniotis</i>	7	12	1780	1768	680.0	858.1
all sites	41	3	1890	1887	1105.0	974.5

and its frequent use of underground monuments as roosts, the species would perhaps have been registered if it was a common element in the southern parts of the Nile Valley of Egypt already at that time. However, no information on the presence of this bat there is available from that period. The former absence of *R. aegyptiacus* in the southern parts of Egypt is indirectly supported also by the (very rare) findings of this bat in the ancient drawings found only in northern Egypt, see e.g., Anderson (1902), Osborn & Osbornová (1998) and Audouit (2016) for reviews.

Although the known localities of the *R. aegyptiacus* occurrence in Egyptian Nubia were destroyed by the construction of the Aswan High Dam and the inundation of the Nile Valley in the length of ca. 350 km in the 1970s, this bat still survives at both edges of this artificial lake. Its occurrence was last confirmed there simultaneously in 2010, in Aswan at the northern edge and in Ferka (N Sudan) near the southern edge (Benda et al. 2011a). The latter record suggests that

the construction and filling of the Dam did not damage completely the Nubian populations of *R. aegyptiacus*, although the formerly continuous occurrence in the vegetated segments of the Nile Valley was probably effectively interrupted by the water masses. Albeit the populations surviving at the southern reach of the inundation of the Aswan High Dam are most probably not quite abundant, considering a very narrow and interrupted belt of vegetation available along the Nile, they could act in the future as source populations for possible colonisation of the newly cultivated areas of southern Egypt, e.g., at Abu Simbel, in Wadi Toshqa, and/or in Sharq El Owainat.

Flower (1932) reported a record of an individual of *R. aegyptiacus* from Marsa Matruh on the north-western shore of the Mediterranean Sea in Egypt. This site represents the westernmost marginal point of the Palaearctic range of this bat (Benda et al. 2011a) and is quite isolated both geographically and historically. Marsa Matruh lies ca. 250 km along the desert-like sea shore west of the closest site of (perhaps) permanent occurrence in Burg El Arab at the western edge of the Nile Delta, where *R. aegyptiacus* was found repeatedly (Wassif et al. 1984). The fruit bat was found in Marsa Matruh only once, in February 1920; such temporarily isolated record suggests an accidental presence at this spot rather than permanent. The westernmost permanent occurrence of *R. aegyptiacus* in the Palaearctic is thus represented by the records in the Dakhla Oasis of Egypt.

In summary, the wide and unstable distribution range of *R. aegyptiacus* in Egypt as well as the temporal presence/absence of this bat documented in various regions of the country suggest high plasticity in occurrence of this bat and ability to use a human activity-dependent variable distribution of the sources, both feeding and roosting, both temporal and geographical.

The Egyptian range of *R. aegyptiacus* represents a highly prevailing part of the distribution of this bat in Palearctic Africa, only two sites are known outside Egypt, in the northern part of the Sudan (Kaisila 1992, Benda et al. 2011a). The remaining part of the Palaearctic section of the distribution range of this bat covers mostly the non-arid parts of the Middle East that stretch from southern Turkey (and one Greek island), via the Levant, Cyprus, the western, southern and eastern offshore areas of the Arabian Peninsula, to southern Iran and south-western Pakistan (Bergmans 1994, Benda et al. 2011a). However, this Palaearctic section represents only a small and geographically well separated offshoot from the main range of *R. aegyptiacus*, which covers most of the savannah zone of sub-Saharan Africa (Bergmans 1994).

TAXONOMY. *Rousettus aegyptiacus* as a species was first described from Egypt; Geoffroy (1810: 96) originally named it ‘La roussette d’Égypte’ *Pteropus Egyptiacus*, and as ‘Patrie’ (= type locality) he mentioned “La basse Égypte. J’en ai plusieurs individus que j’ai détachés moi-même du plafond d’une des chambres de la grande Pyramide”. The original species name *egyptiacus* was emended to *aegyptiacus* by the same author (Geoffroy 1818: 134) and this change was accepted as a justified emendation almost universally, by both elder and recent authors (see e.g., Oken 1816, Desmarest 1820, Temminck 1825, Anderson 1902, Andersen 1912a, Koopman 1993, 1994, Horáček et al. 2000, Simmons 2005, see also Kock 2001). The type locality of *R. aegyptiacus* is generally referred to ‘the Great Pyramid, Giza, Egypt’ [29°58’45”N, 31°08’03”E] or just ‘Giza, Egypt’ (Andersen 1912a, Flower 1932, Allen 1939, Ellerman & Morrison-Scott 1951, Setzer 1952, Sanborn & Hoogstraal 1955, Harrison 1964, Kock 1969, Gaisler et al. 1972, Koopman 1975, 1993, Corbet 1978, Qumsiyeh 1985, 1996, Harrison & Bates 1991, Bergmans 1994, Bates & Harrison 1997, Kwiecinski & Griffiths 1999, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000, Simmons 2005, Benda et al. 2006, Happold 2013a, Lanza et al. 2015, Almeida 2019, Monadjem et al. 2020, etc.).

Pteropus Geoffroyi Temminck, 1825 is another name that appeared concerning the Egyptian populations of *R. aegyptiacus*. Temminck (1825: 197) created this name as a nomen novum for

Pteropus Aegyptiacus Geoffroy, 1810 [= *Rousettus aegyptiacus*] with an explanation as follows: “Je supprime ce nom de contrée très-défectueux, vu l’espèce se trouve au Sénégal, et probablement sur toute la côte septentrionale d’Afrique. J’en fais hommage au savant qui en a fait la découverte. Les naturalistes sont invités d’adopter ce changement de nom, qui est dans l’intérêt de la science.” Although this name was accepted by several authors as a valid name for this bat also in its Egyptian range (Lesson 1834, Wagner 1840, 1855, Rüppell 1842b, von Heuglin 1877), it represents just a junior synonym of *Pteropus aegyptiacus* Geoffroy.

The taxonomic affiliation of the Egyptian populations of *R. aegyptiacus* has been for a long time indisputable, since the description of the species is based on the material from Lower Egypt, they were assigned to the nominotypical subspecies (Allen 1939, Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Eisentraut 1959, Hoogstraal 1962, Kock 1969, Hayman & Hill 1971, Gaisler et al. 1972, Koopman 1975, 1994, Corbet 1978, Qumsiyeh 1985, Bergmans 1994, Kwiecinski & Griffiths 1999, Benda et al. 2006, Happold 2013a, Almeida 2019). This subspecies was reported to differ from other subspecies of this bat mainly by the large size of body and skull, a relatively wide skull, and more massive teeth (Eisentraut 1959, Bergmans 1994, Benda et al. 2006).

This traditional view was challenged when the Sinaitic populations of *R. aegyptiacus* were discovered in 2005 (Benda et al. 2008). Benda et al. (2008, 2012a) compared dimensions of the Egyptian and other Middle Eastern samples of this species and found surprising differences between the continental Egyptian bats and the Sinaitic bats. While all populations from the continental Egypt as well as those from the Levant and Cyprus conformed to the description of the nominotypical subspecies, the Sinaitic populations showed much smaller body dimensions, being in size close to those of the south-Arabian (Yemeni, Omani) and Iranian populations. Thus, in accordance with the traditional view (cf. Eisentraut 1959, Bergmans 1994, Benda et al. 2006), the populations of Sinai should be classified as *R. a. arabicus* Anderson, 1902, a form primarily described as a separate species and for a long time treated in that way (Anderson 1902, Andersen 1907, 1912a, Ellerman & Morrison-Scott 1951, Harrison 1956), but traditionally considered a subspecies of the south-eastern parts of the Middle East and Pakistan (Eisentraut 1959, Harrison 1964, Corbet 1978, Harrison & Bates 1991, Corbet & Hill 1992, Bergmans 1994, Koopman 1994, Kwiecinski & Griffiths 1999, Horáček et al. 2000, Simmons 2005, Almeida 2019). However, a simple genetic comparison of several Egyptian and Middle Eastern samples of *R. aegyptiacus*, based on complete sequences of the mitochondrial gene for cytochrome *b* (Benda et al. 2007: 80), showed the Sinaitic sample to be a member of a homogeneous clade of nearly identical haplotypes from other parts of the Middle East, including continental Egypt. This result completely disproved the assumption of two phylogenetic units within the populations of *R. aegyptiacus* of Egypt and the Middle East as well, and thus the recognition of more than one subspecies there, contrary to the opinions given by numerous previous authors.

An additional genetic comparison of a large number of samples from the Middle East and Egypt complemented by samples from sub-Saharan Africa (Benda et al. 2012a) revealed very low levels of genetic variation in two mitochondrial markers studied and a lack of any robust phylogeographic structure throughout the Palaearctic range of *R. aegyptiacus*. Identical haplotypes were found across the Middle East and sometimes also out of the Middle East, in very distant parts of the range. Such an arrangement of the relations among populations suggested that the contemporary Palaearctic range of *R. aegyptiacus* including the Egyptian parts was colonised relatively recently from a geographically limited population. The phylogeographic signal from the studied genes conformed to a hypothesis of a single invasion of *R. aegyptiacus* from sub-Saharan Africa and subsequent multiple radiations within the Middle East, followed by episodic changes among populations of north-eastern Africa (Ethiopia) and south-western Arabia.

These results in combination with the detailed morphometric analysis (see Benda et al. 2012a: 1234, 1236) showed (1) a mosaic-like distribution of the particular size morphotypes of *R. aegyptiacus* throughout the Palaearctic part of the species range, and (2) no apparent separation of lineages within the examined mitochondrial genes. Therefore, despite their metric differences, all Palaearctic populations, including the continental Egyptian and Sinaitic ones, were suggested to be regarded as the nominotypical subspecies, *R. a. aegyptiacus*. These populations are phylogenetically separated from the African sub-Saharan populations and the populations of the islands of the Gulf of Guinea that represent a series of different subspecies. These conclusions are corroborated by the findings of subsequent more sophisticated analyses that used a large selection of markers sequenced from numerous samples covering representatively the whole distribution range of *R. aegyptiacus* (Hulva et al. 2012, Stribna et al. 2019).

Under this conception, the nominotypical subspecies of *R. aegyptiacus*, originally described from Egypt, is distributed in the Palaearctic part of the distribution range in Africa, i.e., besides Egypt also in the northern part of the Sudan, and in the whole Asian part of the species range, as defined above (southern Turkey, Kastellorizo (Greece), Cyprus, Syria, Lebanon, Palestine, Jordan, Sinai, western Saudi Arabia, Yemen, Oman, UAE, southern Iran, south-western Pakistan; cf. Bergmans 1994, Benda et al. 2011a).

Rhinopoma microphyllum (Brünnich, 1782)

RECORDS. Published data: A s w a n: Tombs opposite to Aswan [1], 1 m (Anderson 1902 [as *R. microphyllum* s.l.], cf. Kock 1969, Qumsiyeh 1985); – Gebel Adda [2], eastern bank of Nile, 20 January, 9–10 February 1964: 6 inds., YPM (Dornburg et al. 2011). – B a n i S u e f: Bani-Swaif [3], 1972–1975 (Saoud & Ramadan 1977b); Beni Swaif Governorate, coll. inds. (Ramadan 1986). – E l J i z a h: Aburoash [4], 1 ind. (Bonhote 1909); Abu Rawash, Giza, 3 March 1909: 1 f, BMNH (Nader & Kock 1983c); Abu Rawash, 2 f, 24 inds., October 1946: 1 m, 1 f, April 1947: 2 inds., March 1948: 1 m, July 1954: 3 inds., July 196: 1 m, November 1961: 1 ind., May 1966: 5 fa, 15 fs, ASUC (Wassif et al. 1984); Abu Rawash, 5 inds., BMNH, FMNH, USNM (Qumsiyeh 1985); – Abu Sir [5], 3 inds., FMNH, USNM (Qumsiyeh 1985); – Dashur [6], Dynasty IV bent pyramid of Seneferu, 5 skeletons (Batravi 1948); – Cairo e delle piramidi [= El Jizah] [7], 1 m, CMSNF (Senna 1906); Gizeh bei Kairo, Cheopspyramide, 3 February 1914: 5 m, 3 f, NMW (von Wettstein 1918); Pyramids of Giza, 1 ind., USNM (Setzer 1952); Giza (Sanborn & Hoogstraal 1955); Gizeh, 1 ind. (Hopkins & Rothschild 1956); Gizeh, 1 ind. (Jordan 1957); Gizeh or Giza, 1 ind. (Hubbard 1960); Giza Pyramid, 8 May & 7 June 1950: inds. (Macy et al. 1961); Giza Pyramid, inds. (Heyneman & Macy 1962); Giza (Hoogstraal 1962); Giza Pyramid, 24 June 1951: 1 ind. (Maa 1965); Giza Pyramids (Madkour 1977b, 1978); Giza Pyramids, 17 June 1894: 2 inds., BMNH (Nader & Kock 1983c); Giza, July 1954: 1 m, 1 f, ASUC (Wassif et al. 1984); Giza Pyramids, 10 inds., BMNH, FMNH, USNM (Qumsiyeh 1985); Giza Governorate, coll. inds. (Ramadan 1986); Giza, 3 inds., BMNH (Van Cakenberghe & De Vree 1994); – Saqqara Pyramids [8], 7 m, 4 f, USNM (Setzer 1952); Sakkara, November 1952: inds. (Jobling 1954); Bent Pyramid, east of Sakkara, 15 May 1950: inds. (Macy et al. 1961); Sakkara area, Bent Pyramid and tombs, inds. (Heyneman & Macy 1962); Sakkara, inds. (Wassif & Madkour 1963); Sakkara, El Aiyat, 28 May 1954: 1 ind. (Maa 1965); Sakkara Pyramids, Cairo Area, 31 January 1947: coll. inds. (Maa 1965); Saqqara, 1821: 1 ind., ZMB (Kock 1969); Sakkara (Madkour 1977b, 1978); Sakkara, March 1953: 1 f, January 1956: 1 m, 1 f, November 1958: 1 f, April 1961: 1 m, January 1965: 1 m, ASUC (Wassif et al. 1984); Saqqara, 22 inds., FMNH, MVZB, USNM (Qumsiyeh 1985); Sakkara, El Aiyat, 1 ind. (Hastriter 2007). – E l Q a h i r a h: [Cairo.] Abassiya [9], 1 ind., USNM (Qumsiyeh 1985); – Cairo [10], 1 m (Anderson 1902 [as *R. microphyllum* s.l.; LA 68 mm]); Nähe von Cairo, 28 December 1900: 1 ind. (Wahlgren 1904); Kairo, 3 m, NHMB (Engelmann 1912); Kairo, 1 m, NHMB (Revilliod 1913); Cairo Area (Hoogstraal 1952); Cairo (Sanborn & Hoogstraal 1955); Cairo, 1901: 1 ind. (Hubbard 1960); Cairo (Hoogstraal 1962); Kairo, 1910: 1 m, ZFMK (von Lehmann 1964 [as *Tadarida teniotis*]); Kairo, 1 ind., ZMB (Kock 1969); südl. Kairo, 1 ind., SMF (Kock 1969); Cairo, 1955: 1 fa, SMF (Nader 1982); South Cairo, 1855: 1 ma, SMF (Nader 1982); nr. Cairo, 22 April 1910: 1 m, ZFMK (Nader & Kock 1983c); Cairo, 1964: 1 f, WICA (Nader & Kock 1983c); S Cairo, 2 inds., SMF (Koch-Weser 1984); Cairo, 3 inds., NHMB (Qumsiyeh 1985); Old City of Cairo, coll. inds. (Ramadan 1986); Cairo, 1 ind., ZMB (Hartwich & Kilias 1990); südlich Cairo, 1955: 1 ind., SMF (Benda et al. 2006, 2009). – E l U q s u r: near Luxor [11], 3 inds., BMNH (Qumsiyeh 1985); Thebe, 1 ind., MHNG (Van Cakenberghe & De Vree 1994); Theben, 1905: 1 ind., MHNG (Benda et al. 2004a, 2006, 2009). – K a f r E s h S h e i k h: Belim, Delta, 1 m, 1 f (Anderson 1902); Belim, 1 ind., BMNH (Van Cakenberghe & De Vree 1994). – Q e n a: Denderah, 1897: 11 inds., ZFMK (von Lehmann 1964 [as *R. microphyllum* s.str.; the respective specimens

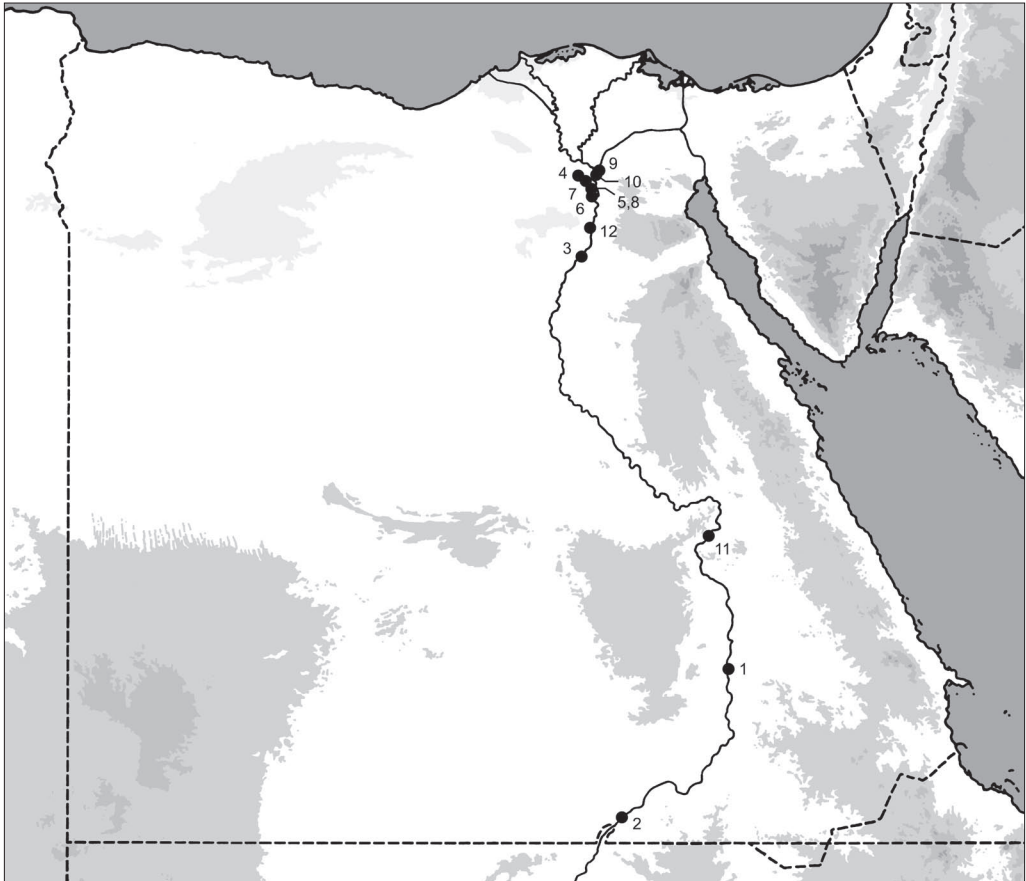


Fig. 6. Records of *Rhinopoma microphyllum* (Brünnich, 1782) in Egypt; for explanations see Fig. 3.

were re-identified as *R. hardwickii* [s.l.] by Kock (1969) and Benda et al. (2006), and as *R. cystops* by Benda et al. (2009, 2014b, respectively)). – **Unpublished data:** B a n i S u e f: Mastab [12], Pyramide von Maidum, 6 February 1988: 1 ma (ZFMK 96.468 [A]; leg. J. Handwerk).

IMPRECISE RECORDS. Egypt, 1 ind., BMNH (Anonymous 1839 [as *R. microphylla* s.l.]); Egypt, 4 inds., BMNH (Gray 1843 [as *R. microphylla* s.l.]); Égypte (Gervais 1854 [as *R. microphyllum* s.l.]); Aegypten (Wagner 1855 [as *R. microphyllum* s.l.]); Aegypten (Kolenati 1857a, 1858a, b [as *R. microphyllum* s.l.]); Ägypten (Kolenati 1859a, b [as *R. microphyllum* s.l.]); Egypten (von Heuglin 1877 [as *R. microphyllum* Brünn.]); Egypt, 1 ma, 4 inds., BMNH (Dobson 1878 [as *R. microphyllum* s.l.]); Egypte, 7 inds., RNHL (Jentink 1887 [as *R. microphyllum* s.l.]); Egypte, 1 ma, 1 fa, 1 fs, 1 ind., RNHL (Jentink 1888 [as *R. microphyllum* s.l.]); Egitto, inds. (Sonsino 1896); Egypten (Palacký 1901 [as *R. microphyllum* s.l.]); Ägyptus (Trouessart 1904); Aegypten, 1 f, NHMB (Reveillod 1913); Egypt (Allen 1939, Hoogstraal 1955, Hoogstraal 1956); Ägypten (Möhres & Kulzer 1956b); Egypt, 2 inds. (Wells & Randall 1956); Ägypten, 6 inds., SMF (Felten 1962); Egypt, inds. (Hoogstraal & Traub 1963); Egypt, 1955 & 1956: colony (Theodor 1968); Ägypten, 13 inds., MSNG, SMF, SMNS, ZMB (Kock 1969); Egypt, 6 inds. (DeBlase 1972a); Egypt, numerous specimens (Schlitter & DeBlase 1974, DeBlase 1980); Egypt (Madkour 1976b); Egypt, 1972–1975: 12 inds. (Saoud & Ramadan 1976b); Egypt, 4 inds., BMNH (Hill 1977); A. R. Egypt, inds. (Madkour 1977c); Egypt, 1822 and 1831: 4 ma, 2 inds., SMF (Nader 1982); Egypt, 6 inds., BMNH, NHMB, SMNS, USNM (Qumsiyeh 1985); Egypt, 16 inds., BMNH, IRSN, MNHN, RNHL, SMF (Van Cakenberghe & De Vree

1994); Egypt, 9 m, 8 f (Riad et al. 2000); Ägypten, October 1991: 1 ind., ZMH (Bergemann 2003); Ägypten, before 1822: 4 inds., before 1831: 2 inds., SMF (Benda et al. 2006, 2009); Egypt, 1962: 6 inds., YPM (Dornburg et al. 2011). – Nubien (Fitzinger & von Heuglin 1866, Hartmann 1868 [as *R. microphyllum* s.l.]); Nubia (Flower 1932 [as *R. microphyllus* s.l.]). – L’Egypte, dans les souterrains des pyramides du Caire et de Gyzeh (Desmarest 1820 [as *R. microphylla* s.l.]); in parte imâ Pyramidum prope Caïro et Gizeh Aegypti (Fischer 1829 [as *R. microphyllum* Geoffr.]). – vicinity of Cairo [9–10] and Giza [4–8] Province, October 1959 – October 1961: 2 inds. (Mohammed & Saoud 1965).

DISTRIBUTION. *Rhinopoma microphyllum* is an uncommon bat species in Egypt, it has been documented only from twelve sites (Fig. 6). The localities are concentrated to two geographic regions of Egypt only, the Cairo Region and Nile Valley (Table 2). In the latter region, the few available records are scattered along the whole Egyptian length of the Nile. Most records are known from the Cairo Region and most probably, also a majority of the geographically unspecified records of *R. microphyllum* from Egypt originate from this area. The Egyptian records of *R. microphyllum* come from a very narrow altitude range of lowland localities (20–185 m a. s. l., median 52.5 m, mean 71.4 m; Fig. 4, Table 3).

The current picture of distribution of this bat in Egypt conforms to the view given by Qumsiyeh (1985), with a certain exception; in the distribution description and map of *R. microphyllum* (pp. 16–17), this author presented also two records from the Nile Delta. However, these localities are erroneous and this desert-dwelling bat has not been ever documented from this region. The finding from Beltim, Delta, published by Anderson (1902) was corrected by Flower (1932), who reported the two respective specimens as of unknown origin, probably purchased in Cairo (see also footnote on p. 130). One of these bats was deposited by J. Anderson to the BMNH collection (♂, BMNH 3.12.8.26.) with the original labelling (own obs.); this bat was examined by Van Cakenberghe & De Vree (1994), who reported it under this false location again. Another erroneous mention from the Nile Delta is based on Qumsiyeh’s (1985) misinterpretation of the location of Beni Hasan (Anderson 1902). This site (an ancient necropolis) lies in the Nile Valley ca. 20 km south of El Miniya [ca. 27°56’N, 30°53’E], but Qumsiyeh (1985) regarded it a village of the same name in the Ed Daqahliyah Governorate [ca. 30°54’N, 31°41’E]. Moreover, in the case of the Beni Hasan record it is really impossible to identify the species of *Rhinopoma* according to the data given by Anderson (1902), who did not distinguish between the two Egyptian species, and this record is not included here among the findings of *R. microphyllum* (the ‘Beltim’ record could be identified to the species due to existence of the BMNH specimen; Van Cakenberghe & De Vree 1994, own data).

Majority of the reports of *R. microphyllum* available from the 19th century cannot be easily affiliated with this species in its current sense, since until the taxonomic revision by Thomas (1903b) only one species of the genus *Rhinopoma* Geoffroy, 1818 was reported from Egypt. Thomas (1903b) demonstrated two size categories within the genus to occur in Egypt and the Sudan, he attributed the name *R. microphyllum* to the large-sized morphotype and described the small-sized morphotype as a new species *R. cystops*. Therefore, the old unidentifiable reports are here attributed to a non-specific name *R. microphyllum* s.l. The identification of species in the modern sense is possible only in the cases when the author gives any character which helps to distinguish between the two species, e.g., a body measurement. However, such cases are very rare.

Under the name *R. microphyllum* [s.l.], Anderson (1902) reported a large series of specimens from nine sites of Egypt, in 24 specimens he mentioned their body dimensions; while the forearm length (LAt) in 22 bats was in the range of 50–60 mm (mean 53.9 mm) and these individuals apparently represent *R. cystops*, two other bats, a male from Cairo with LAt 66 mm and a male from Aswan with LAt 71 mm, belong to *R. microphyllum* s.str. with most probability. Concerning the latter specimen, this identification was already suggested by Kock (1969) and Qumsiyeh (1985). This size difference conforms with the findings by previous authors; for instance, Hill

(1977) reported for the Egyptian and Sudanese populations of *R. cystops* the LAt in the range of 46.2–62.1 mm (n=240) and of *R. microphyllum* 59.9–69.7 mm (n=10); Qumsiyeh (1985) for the Egyptian populations of *R. cystops* the range of 50.0–61.0 mm (n=38) and for *R. microphyllum* 64.2–71.0 mm (n=24). A similar case is the ZFMK series of *R. microphyllum* from the Dendera Temple Complex reported by von Lehmann (1964). It was shown to represent *R. cystops* in fact (see Kock 1969, Benda et al. 2006, 2009, 2014b), as the LAt values of this series lie within the range of 48.7–55.5 mm (mean 51.9 mm, n=9; own data).

Although *R. microphyllum* ranks among rather infrequent bats of Egypt, it is the first bat species described possibly from this country*. At least one individual collected most probably by Fredrik Hasselquist (1722–1752) in the Cairo Region (presumably in some of the pyramids) in July or August 1750 (see Hasselquist 1766: 69–71, 86–87) was finally deposited in the ZMUC collection where it remains until present (Van Cakenberghe & De Vree 1994). Since Hasselquist (1757, 1766) did not mention the collection of the bat (although he mentioned collections or observations of other animals), it is not clear whether he collected only one or a series of specimens and where he made this collection. Anyway, based on a single specimen, Morten T. Brännich (1737–1827)

* NOTE. In fact, the first bat name formally described from Egypt is *Vespertilio aegyptiacus* Hasselquist, 1757. However, this name is an unavailable name, since it is a pre-Linnaean name, and moreover, it is a taxonomic mystery (i.e., a nomen dubium in the case it has a potential nomenclatoric use). The description given by Hasselquist (1757: 197) represents a mosaic of characters that does not give a result concerning species identification, see as follows: “CAPUT. Dentes incisores in maxilla superiore 2, longiores. Canini 2 utrinque, quorum unus longior, alter brevior. Molares 4 utrinque, obtusiores, breves; Maxillae inferioris dentes anticis dentibus similes. // Nares in apice maxillae superioris parum distantes, protuberantes foraminibus minimis. // Mystaces seriebus 2 constructi, una supra alteram: Pilis minimis, mollissimis. // Auriculæ parum acuminatæ, Lobulo in inferiore parte auris, oblongo, acuminato, libero. // Pedes anteriores unguiculo unico digito instructi. Posteriores 5, quorum interiores paulo breviores. // CAUDA longitudine corporis, alæ utrinque affixa. // ALÆ totum corpus a pedibus anterioribus cingunt, lateribus latiores, versus caudam angustiores. // CORPUS totum supra fuscum, subtus albicans. // MAGNITUDO Muris domestici minimi. // LOCUS Rosette ad ripas Nili in hortis.” This name remained overlooked for a long time, Linnaeus (1758, 1766) or Gmelin (1788) did not include it in the *Systema Naturae*, although Carl Linné (1707–1778) himself edited the Hasselquist’s text posthumously. It is missing also in the list of Egyptian mammals by Geoffroy (1818). Anderson (1902: 84) was the first who tried to affiliate this name and included it into synonymy of *Roussettus aegyptiacus*. However, the name *V. aegyptiacus* is not applicable to the fruit bat, since the description mentions numerous characters that do not fit this species, viz. two upper incisors, tragus present in the ear, claw present only on the first finger of the hand, tail as long as body, and the body size similar to that of a small house mouse. This inconsistency was pointed out already by Setzer (1952: 346) who concluded as follows: “This is erroneous since the description in 1757 is not tenable but does state that *V. aegyptiacus* has a tragus, that it is of small domestic mouse size and that the tail is the same length as the body. The name, if it were tenable, would have to be used for *Rhinopoma microphyllum*.” A similar view was expressed with a question mark also by Benda et al. (2006). However, the Setzer’s (1952) conclusion is also incorrect since bats of the genus *Rhinopoma* have a small nose-leaf instead of the nasals in the pointed nose, a free tail instead of the tail enclosed in the wing membrane, and a greyish or brownish belly instead of whitish. Moreover, until now the *Rhinopoma* bats have not been confirmed in the Nile Delta, while Hasselquist (1757) reported his bat to be found in gardens on the banks of the Nile at Er Rashid (Rosetta). Besides the *Rhinopoma* bats, five other genera of Egyptian bats have tragus in their ears and two incisors in the upper jaw, viz. *Taphozous*, *Nycticeinops*, *Otonycteris*, *Tadarida*, and *Nyctinomus*. However, none of these bats fits with the character matrix given by Hasselquist (1757). Records of *Nycticeinops*, *Otonycteris*, or *Nyctinomus* in the Nile Delta are most unlikely since these bats are inhabitants of arid or semi-arid habitats; *Otonycteris* does not have a brown dorsal pelage; *Tadarida*, and *Nyctinomus* do not have pointed ears; *Taphozous*, *Tadarida*, and *Nyctinomus* do not have a completely enclosed tail into the wing membrane; *Taphozous* and *Nyctinomus* do not have a whitish belly. On the other hand, in some individuals of pipistrelle-like bats (*Pipistrellus*, *Vansonia*, *Hypsugo*, etc.), the distal pair of the upper incisors could be so small that they remain unnoticed and the upper jaw looks like having just two incisors. Anyway, a specimen collected by F. Hasselquist at Er Rashid which could be used as a type of *Vespertilio aegyptiacus* (see Brännich 1782) perhaps does not exist and the solution based just on the published description seems to be impossible. Thus, *Vespertilio aegyptiacus* cannot be considered a sufficiently described taxon, affiliable to any bat species occurring in Egypt and known to modern taxonomy. Thus, the first really described bat from Egypt remains undoubtedly *Rhinopoma microphyllum* (regardless its clear availability for taxonomy given by the year of publication).

described this bat as *Vespertilio Microphyllus* (= *Rhinopoma microphyllum*) in 1782 (see Brännich 1782: 50–51; Fig. 7).

Additionally, *R. microphyllum* was demonstrated to be the oldest documented bat species in a cultural context of Egypt; five skeletons of this bat were discovered in a mummy case along with a mummy of *Tyto alba* (Scopoli, 1789) found in the Bent Pyramid of Sneferu at Dahshur (Batrawi 1948), dated from the Fourth Dynasty period. Hence, the bat mummies are older than 4,500 years. With most probability, this finding represents the oldest bat preparations in the history as well. In Egypt, some other findings of bats were made in excavations of ancient sites (see under particular species below), but perhaps none of them of such high age and mainly, none of them as an intentionally prepared ‘specimen’.

According to the present knowledge, the Egyptian occurrence area of *R. microphyllum* is isolated from the remaining segments of the distribution range of this bat, covering a broad area of semi-arid habitats in a longitudinal belt from West Africa to Indochina (Hill 1977, Van Cakenberghe & De Vree 1994). The closest occurrence spot to the Egyptian range is situated in the east, in the Rift Valley of the Holy Land between southern Lebanon and the Gulf of Aqaba (Mendelssohn & Yom-Tov 1999, Benda et al. 2010). In the south, the closest *R. microphyllum* presence is known from Khartoum region of the central Sudan (Koopman 1975, Hill 1977). However, this bat is a rather rarely documented faunal element throughout the western section of its distribution range, i.e., in the northern part of Africa and in the Middle East (see Kock 1969). The missing records of *R. microphyllum* from certain less surveyed regions may not represent its real absence there. It is well possible that in Sinai and Sudanese Nubia this bat occurs and just remains hidden to the eyes of bat researchers; for instance, this bat has been only recently recorded for the first time in Algeria (Loumassine et al. 2018), in a country with long tradition of the research of desert bats.

TAXONOMY. Although bats of the genus *Rhinopoma* were the first bats reported from Egypt, as early as in the 16th century (Belon du Mans 1553), the taxonomy of this genus was confused for a long time namely in north-eastern Africa and till now, it contains some unresolved points (see e.g., Van Cakenberghe & De Vree 1994). The confusion was caused mainly by (1) an unclear number of species distinguished within the genus occurring in Egypt, the Sudan and the Levant, and (2) inconsistency in naming of these species. These problems were elucidated by Thomas (1903b), who demonstrated the existence of two species of *Rhinopoma* in these countries and justifiably affiliated names to them, *R. microphyllum* to the large-sized species, and *R. cystops* to the small-sized species. Nevertheless, it took certain time until this taxonomic conception was adopted completely (see e.g., Anderson 1902, Flower 1932); until then, only one name appeared regularly, *R. microphyllum* [s.l.], used for both species. Brännich (1782: 50) described this bat as *Vespertilio Microphyllus*, Geoffroy (1818: 123) placed this species into his newly created genus *Rhinopoma*, and Fischer (1829: 123) emended the spelling of the species name to the grammatically correct variation *microphyllum*.

As mentioned above, *Rhinopoma microphyllum* as a species was first described by Brännich (1782), based on the specimen collected presumably by F. Hasselquist during his travel to Egypt and Arabia in 1750 (Fig. 7). Concerning the origin of the described bat, Brännich (1782: 51) mentioned: “Formodentlingen har denne Flaggermus hieme i Orienten, hvorsra jeg mener Dyret, som her beskrives og giemmes i Naturaltheatret, har været hidsendt med Samlingerne, som ere giorte af det for nogle Aar siden paa Kongelig Bekostning fra Dannemark til Arabien udsendte lærde Selskab: Den kunde i saa Fald være taget ved de Ægyptiske Pyramider, i en af hvilke Belon fortæler at have fundet en Art Flaggermus, som var særskilt fra vores Europæiske og dem han saae paa Den Crete, thi Halen, siger han, hængte omtrent fire Finger uden for Arsskindet, og lignede en Muse-Hale.” This text can be summarised as follows: “the origin of the specimen is actually



Fig. 7. An image of *Vespertilio Microphyllus* Brünnich, 1782 published as an illustration of the species description (Brünnich 1782: Table VI).

unknown, although it could come from the Haselquist's collection of items from the Orient; Belon du Mans reported such a bat to occur in the pyramids of Egypt and thus, our specimen could also originate from these pyramids". However, Anderson (1902: 147) summarised this text incorrectly as follows: "Hasselquist also obtained this bat in one of the small Pyramids of Gizeh."

Thus, the type locality of *R. microphyllum* is treated in two variations, a broader geographical meaning, 'Arabia and Egypt' (Allen 1939, Ellerman & Morrison-Scott 1951, Setzer 1952, Harrison 1964, Corbet 1978, Corbet & Hill 1992, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000), apparently being derived from the unclear definition by Brünnich (1782), and a more specific meaning, 'Giza, Egypt' (Flower 1932, Sanborn & Hoogstraal 1955, Aellen 1957, Koopman 1993, Aulagnier 2013, Lanza et al. 2015), coming from the misinterpreted version by Anderson (1902). Besides these two variations, the following authors used combined expressions, however, without a specification which variation they really preferred and accepted; viz. Kock (1969: 54): "Arabien und Ägypten; Pyramiden von Gizeh (fide Anderson & de Winton 1902 und Aellen 1957)."; Koopman (1975: 366): "'Arabia and Egypt'; [...], Brünnich's types were obtained by Hasselquist at Giza, Egypt, to which the type locality may be fixed."; Hill (1977: 33): "Arabia and Egypt; according to Anderson & de Winton (1902: 147) the original specimen came from the 'Pyramids of Gizeh'. Type-locality fixed at Giza by Koopman (1975: 366)."; Horáček (2019: 172): "Arabia and Egypt. Restricted by K. F. Koopman in 1975 to Giza, Egypt". With quotations of some of these sources, several other authors used similar expressions (Qumsiyeh 1985, 1996, Harrison & Bates 1991, Van Cakenberghe & De Vree 1994, Schlitter & Qumsiyeh 1996, Bates & Harrison 1997, Simmons 2005).

Benda et al. (2006: 20) tried to specify the type locality based on an evaluation of the published evidence and concluded as follows: "Hasselquist [...] did not give any details how he obtained the bat in Egypt and thus the Anderson's (1902) restriction could reflect either an examination of the type material, although Anderson did not mention it, or an erroneous quotation of the record by Belon du Mans (1553) (but where 'grande' was changed to 'small') and certainly not that by Hasselquist (1757). Otherwise, Anderson's (1902) restriction should be considered erroneous. Therefore, we suggest to restrict the type locality of *Vespertilio Microphyllus* according to the original Brünnich's (1782) description, i.e., 'Egyptian pyramids' which could refer to one or more pyramids in Egypt, in the area geographically defined as 'Lower Egypt in between Abu Rawash in the north and Beni Suef in the south'." This opinion could be more correct considering Hasselquist's (1757) description of his travels to Egypt, where he visited many monuments, and besides the Pyramids of Giza (according to the note on the Sphinx statue), also the pyramids of Abusir and of Saqqara. However, the Brünnich's (1782) note on pyramids concerns the observation by Belon du Mans (1553) and not by Hasselquist (1757). Thus, the Anderson's sentence in which he linked the type specimen of *R. microphyllum* to the Pyramids of Egypt or even of Giza, is quite erroneous. The restrictions of the type locality based on this concept by Anderson (1902), Kock (1969), Koopman (1975), and/or by Benda et al. (2006) are thus unjustified, and the most correct definition of the type locality of *R. microphyllum* remains 'Arabia and Egypt', i.e., the above mentioned more widely defined variation, which best reflects the description given by Brünnich (1782), and suggested first by Allen (1939).

The taxonomic affiliation of the Egyptian populations of *R. microphyllum* is clear; since the species description is based on a bat from Egypt or the Levant, all involved authors assign them to the nominotypical subspecies (Hoogstraal 1962, Kock 1969, Hayman & Hill 1971, Gaisler et al. 1972, Hill 1977, Corbet 1978, Qumsiyeh 1985, Koopman 1994, Van Cakenberghe & De Vree 1994, Schlitter & Qumsiyeh 1996, Horáček et al. 2000, Aulagnier 2013). However, the species was originally considered monotypic, occurring only in the African and West-Asian parts of the currently recognised range (Allen 1939, Ellerman & Morrison-Scott 1951, Flower 1932, Sanborn

& Hoogstraal 1955). Aellen (1959) first reported the nominotypical form of *R. microphyllum* from the westernmost part of the Oriental region, where it comes into contact with the Oriental form, *R. kinneari* Wroughton, 1912, and suggested to regard both forms conspecific. This opinion was generally accepted by the subsequent authors (Felten 1962, Kock 1969, Hill 1977, Koopman 1994, Van Cakenberghe & De Vree 1994, Schlitter & Qumsiyeh 1996, Bates & Harrison 1997, Horáček et al. 2000, Simmons 2005). In accordance with the results of the most comprehensive revision of the geographical variation in *R. microphyllum*, covering its whole distribution range (Van Cakenberghe & De Vree 1994), this bat represents a polytypic species creating three to four named geographical forms. The Egyptian populations belong to the medium-sized nominotypical subspecies, distributed from West Africa and Sudan to the Middle East and Pakistan. This taxonomic opinion is corroborated by the results of several molecular genetic analyses (Hulva et al. 2007, Levin et al. 2008, Akmal et al. 2011, Benda et al. 2012b, Bagherfard et al. 2020) that demonstrated relatively very shallow divergences among populations of *R. microphyllum* living in the area between Morocco and western India, including Egypt and the Levant. This again supports an existence of a single taxon in this extensive range, i.e., *R. m. microphyllum*. Finally, Horáček (2019) even suggested to consider this species as monotypic in its whole range.

Rhinopoma cystops Thomas, 1903

RECORDS. Published data: A s y u t: Asyut [1] (Wassif 1995 [as *R. hardwickei*]); – Dir Rifa [2], caves in the hills above the village, inds. (Fahmy et al. 1984 [as *R. hardwickei*]); – Gebel Drunka [3], 4 inds., FMNH (Qumsiyeh 1985 [as *R. hardwickei*]); Jebel Drunka, 1 ind., FMNH (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); – Montfalut [4], Krokodilhöhle, numerous inds. (Brehm 1864, 1876 [as *R. microphyllum* s.l.]); – A s w a n: Abu Simbl [5], 14 January: 1 ind. (Becker 1903 [as *R. microphyllum* Geoffr.]); Abu Simbel, 1910: 1 m, ZFMK (von Lehmann 1964); Abu Simbel, 9 February 1910: 1 ind., ZFMK (Kock 1969 [as *R. hardwickei*]); – Tombs opposite to Assuan [6], 6 m, 3 f (Anderson 1902 [as *R. microphyllum* s.l.]); Aswan, tomb across the Nile, small number (Maser 1966 [as *R. hardwickei*]); Aswan, February 1949: 5 f, ASUC (Wassif et al. 1984 [as *R. hardwickei*]); Aswan, 1 ind., BMNH (Qumsiyeh 1985 [as *R. hardwickei*]); Aswan, 2 inds., BMNH, CMNH (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); Aswan Gov., 2 inds., FMNH (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); Garbu Suam, 2 inds., MSNG (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); Aswan (Wassif 1995 [as *R. hardwickei*]); Aswan, Tombs of Nobles, 9 January 2011: obs. a colony of ca. 1000 inds., coll. 3 ma, 5 fa, NMP (Benda et al. 2014a, b); – Edfu [7], 18 August 1963: 10 inds, SMF (Kock 1969 [as *R. hardwickei*]); Idfu Temple, 1 ind., CMNH (Qumsiyeh 1985 [as *R. hardwickei*]); Edfu, 21 inds., CMNH, SMF (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); – Gebel Adda [8], 7 & 9 February 1964: 3 inds., YPM (Dornburg et al. 2011 [as *R. hardwickii*]); – Ombos [9] (Oken 1816 [as *Vespertilio microphyllus* s.l.]); Ombos (Geoffroy 1818, 1828 [as *R. microphyllus* s.l.]); Ombos (Presl 1834 [as *R. microphyllum* s.l.]); Ombos, in den alten Gebäuden (Fitzinger 1861 [as *R. microphyllum* s.l.]); – Small cave in desert hills to east of Philae [10], 1 m, 1 f (Anderson 1902 [as *R. microphyllum* s.l.]); Philae, 1 m, CMSNF (Senna 1906); Philae, 1 ind., NHMB (Qumsiyeh 1985 [as *R. hardwickei*]); – Sheikh Ali [11], 15–20 km N of Aswan [= Sheikh Jarad], 29 April 1984: 1 m, NMP (Benda et al. 2008). – B a n i S u e f: Beni Suef [12], 19 June 1950: inds. (Jobling 1954); Beni Swaif Governorate, coll. inds. (Ramadan 1986 [as *R. hardwickei*]); – Maidum Pyramid [13], 19 June 1950: inds. (Jobling 1954). – E l B e h e i r a h: Wadi Natrun [14], 28 May 1950: 1 ind. (Jobling 1954 [as *Rhinopoma* sp.]); Western Desert (Wadi Natroun) (Sanborn & Hoogstraal 1955 [as *R. hardwickei*]); Wadi Natroun, monastery buildings (Hoogstraal 1962 [as *R. hardwickei*]); Wadi Natroun, May (Hoogstraal & Traub 1963 [as *R. hardwickei*]); Wadi El Natrun, 10 inds., FMNH (Qumsiyeh 1985 [as *R. hardwickei*]); Wadi El Natrun (Wassif 1995 [as *R. hardwickei*]). – E l F a y u m: Faiyum [15] (Sanborn & Hoogstraal 1955 [as *R. hardwickei*]); El Faiyum (Wassif 1995 [as *R. hardwickei*]); Fayoum, inds. (Garo & El Garhy 2005 [as *R. hardwickei*]); – Kom O Shim [16], 1 ind. (Hoogstraal 1952); Kom Oshim, 1 ind., USNM (Qumsiyeh 1985 [as *R. hardwickei*]). – E l J i z a h: Abu Roash [17], May 1901: many specimens (Anderson 1902 [as *R. microphyllum* s.l.]); Aburoash, 1 ind. (Bonhote 1909); Abu Rawash, inds. (Madkour 1961 [as *R. hardwickei*]); Abu Rawash, inds. (Wassif & Madkour 1963 [as *R. hardwickei*]); Abu-rawash, 29 inds. (Rifat et al. 1967); Abu Rawash, inds. (Varma & Converse 1976 [as *R. hardwickei*]); Abu Rawash (Madkour 1978 [as *R. hardwickei*]); Abu Rawash, March 1948: 1 m, 1 f, January 1958: 1 m, April 1958: 1 m, November 1958: 1 m, January 1960: 2 m, ASUC (Wassif et al. 1984 [as *R. hardwickei*]); Abu Rawash, 35 inds., BMNH, CMNH, USNM (Qumsiyeh 1985 [as *R. hardwickei*]); Abu Rawash, October 1980: 1 ind., ZMH (Bergemann 2003 [as *R. hardwickei*]); Abu Rawash, inds. (Garo & El Garhy 2005 [as *R. hardwickei*]); Abu-Rawash area, 6 inds. (Ali 2011 [as *R. hardwickei*]); Abu-Rawash area, inds. (Sayed 2011 [as *R. hardwickei*]); Abou-Rawash Constituency, coll. inds. (Sakr & Ramadan 2010, Taki-El-

-Deen et al. 2013 [as *R. hardwickei*]; Abu-Rawash, 2010 & 2011: 20 ma (Selim 2015 [as *R. hardwickei*]); – Abu Sir [18], April (Hoogstraal & Traub 1963 [as *R. hardwickei*]); Abu Sir, Giza, December 1953: inds. (Maa 1965); Abu Sir, 3 inds., FMNH (Qumsiyeh 1985 [as *R. hardwickei*]); – El Badrshein [19], 11 inds., FMNH (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); – in einer kleinen Pyramide zu Gyzeh [20] (Oken 1816 [as *Vespertilio microphyllus* s.l.]); Égypte (Lesson 1834 [as *R. microphyllum* s.l.]); Džiza [= El Jizah] (Presl 1834 [as *R. microphyllum* s.l.]); Pyramiden von Dschise, die Grabgewölbe und tief abwärts führenden Schlotte, 1855: 15 inds. (Frauenfeld 1856 [as *R. microphyllum* Geoffr.]); Pyramiden bei Kairo (Kolenati 1857a [as *R. microphyllum* s.l.]); Gewölben der Pyramiden (Kolenati 1857b [as *R. microphyllum* s.l.]); Gizeh und Kairo, Grabesgewölben der Pyramiden (Fitzinger 1861 [as *R. microphyllum* s.l.]); Pyramiden von Gizeh (Hartmann 1868 [as *R. microphyllum* Geoffr.]); seconde pyramide de Ghizeh, numerous inds. (Looss 1896 [as *R. microphyllum* Geoffr.]); [Ghizeh,] Autumn 1897: 1 ind., end of April 1898: numerous inds. (Looss 1899 [as *R. microphyllum* s.l.]); Gizeh, Second Pyramid, 5 m, 4 f (Anderson 1902 [as *R. microphyllum* s.l.]); Cairo e delle piramidi, 1 m, CMSNF (Senna 1906); 8 miles southwest of Cairo, at the Pyramids, 9 m, 3 f, USNM (Setzer 1952); Pyramids of Giza, 4 inds., USNM (Setzer 1952); Giza Pyramids, S.W. of cairo, inds. (Jobling 1954); Giza (Sanborn & Hoogstraal 1955 [as *R. hardwickei*]); Giza (Hoogstraal 1957 [as *R. hardwickei*]); Giza Pyramid, 14 May 1951: inds. (Macy et al. 1961 [as *R. hardwickei*]); Giza pyramids and tombs., inds. (Heyneman & Macy 1962 [as *R. hardwickei*]); Giza (Hoogstraal 1962 [as

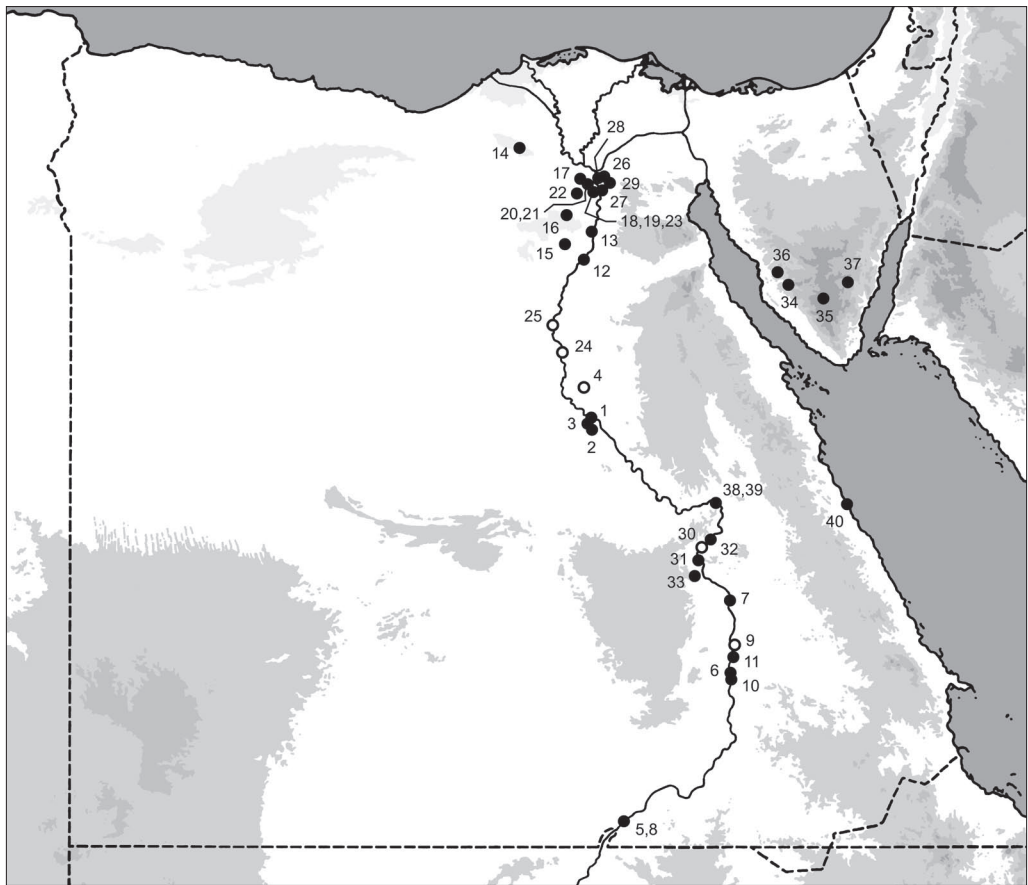


Fig. 8. Records of *Rhinopoma cystops* Thomas, 1903 in Egypt; for explanations see Fig. 3. Open symbols denote records of uncertain species identification of bats of the genus *Rhinopoma* (for details see text).

R. hardwickei]; Pyramids of Giza, inds. (Wassif & Madkour 1963 [as *R. hardwickei*]); Giza Pyramids, June 1951: 1–2 inds., December 1953: 1–2 inds. (Maa 1965); Giza (Baruš 1973 [as *R. hardwickei*]); Giza, inds. (Varma & Converse 1976 [as *R. hardwickei*]); Giza, 1972–1975 (Saoud & Ramadan 1977b, d [as *R. hardwickei*]); Giza Pyramid, June 1959: 1 m, ASUC (Wassif et al. 1984 [as *R. hardwickei*]); Grabkammern in der Nähe der Pyramiden von Gizeh, 6 August 1983: coll. 8 m, 2 f, several inds. (Kulzer et al. 1985 [as *R. hardwickei*]); Giza Pyramids, 68 inds., AMNH, BMNH, FMNH, MCZ, USNM (Qumsiyeh 1985 [as *R. hardwickei*]); Giza Governorate, coll. inds. (Ramadan 1986 [as *R. hardwickei*]); Gizeh, 13 inds., AMNH, FMNH, HZM, MCZ (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); Gizeh pyramid, 1 ind., FMNH (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); Gizeh prov., 2 inds., FMNH (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); Giza (Wassif 1995 [as *R. hardwickei*]); – 2 km. from Giza Pyramids [21], 4 June 1950: coll. inds. (Jobling 1952); Giza Pyramids, 2 km from, June 1950: 1 ind. (Maa 1965); – 8 ml. S.W. of Giza Pyramids [22], 20 July 1946: inds. (Jobling 1954); – Gräbern von Saqārah [23] (Hartmann 1868 [as *R. microphyllum* Geoffr.]); Sakkara, Pyramides (Gohar 1934 [as *R. microphyllum* Geoffr.]); Sakkara, April 1821: 2 inds., ZMB (Stresemann 1954 [as *Vespertilio brevicauda* and *V. ferox*], Turni & Kock 2008 [as *R. hardwickii*]); near Sakkara, Giza, 20 May 1950: coll. ind. (Jobling 1952); Sakkara, near Cairo, 27 June 1950: inds. (Jobling 1954); Sakkara, 12 May 1951 and 10 June 1952: inds. (Jobling 1954); Sakkara, 16 March & August 1951: inds. (Macy et al. 1961 [as *R. hardwickei*]); Sakkarah, inds. (Madkour 1961 [as *R. hardwickei*]); Sakkara pyramids and tombs, inds. (Heyneman & Macy 1962 [as *R. hardwickei*]); Sakkara, March, April (Hoogstraal & Traub 1963 [as *R. hardwickei*]); Sakkara Pyramids, Cairo Area, 31 January 1947: coll. inds., May 1950: 1 ind., October 1950: 1 ind. (Maa 1965); Saqqara, 3 inds., ZMB (Kock 1969 [as *R. hardwickei*]); Sakkara, steppe pyramid, the “Prison of Joseph” catacombs, 23 April 1969: obs. a colony of ca. 100 inds., coll. 6 ma, 3 ms, 10 fa, 1 fs, IVB (Gaisler et al. 1972 [as *R. hardwickei*]); Saqqara, inds. (Varma & Converse 1976 [as *R. hardwickei*]); Sakkara (Madkour 1978 [as *R. hardwickei*]); Saqqara, 1 ind., SMF (Koch-Weser 1984 [as *R. hardwickei*]); Sakkara, 18 inds., May 1951: 1 m, July 1954: 2 inds., June 1959: 2 m, April 1960: 5 m, August 1960: 1 m, May 1961: 1 m, July 1961: 5 m, August 1961: 9 m, ASUC (Wassif et al. 1984 [as *R. hardwickei*]); Saqqara, 40 inds., FMNH, MQC, USNM (Qumsiyeh 1985 [as *R. hardwickei*]); Sakkara, coll. 3 m, 3 f (El-Dawy & Ibrahim 1994 [as *R. hardwickei*]); Saqqara, 14 inds., CMNH, FMNH, SMF (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); Saqqara (Wassif 1995 [as *R. hardwickei*]); Sakkara, Prison of Joseph, 23 April 1969: 4 m, 4 f, IVB (Benda et al. 2004a, 2006 [as *R. hardwickii*], 2009, 2014b); near Sakkara, Giza, 1 ind. (Hastriter 2007); Sakkara, catacombs, 20 June 1971: 2 fa, IVB (Benda et al. 2008); Saqqara, April 1821: 2 m, ZMB (Turni & Kock 2008); Sakkara area, 2012–2014: coll. 120 inds. (Soliman 2015, Soliman et al. 2015 [as *R. hardwickii*]); Saqqara, 2012–2013: coll. 40 m, 32 f (Mansour et al. 2016, 2017). – E l m i n i y a: Beni Hassen [24], hole, obs. hundreds of inds. (Gurney 1876 [as ‘long-tailed bats’]); Beni Hasan, 1 m (Anderson 1902 [as *R. microphyllum* s.l.]); – Felsen des Gebel-Ṭēr [25] (Hartmann 1868 [as *R. microphyllum* Geoffr.]); – E l Q a h i r a h: Gebel Ahmar [26], inds. (Madkour 1961 [as *R. hardwickei*]); Jebel Ahmar, Cairo, April 1953: inds. (Maa 1965); Jebel Al-Ahmar, 1972–1975 (Saoud & Ramadan 1977a [as *R. hardwickei*]); Gebel El Ahmar, 1 ind., FMNH (Qumsiyeh 1985 [as *R. hardwickei*]); – Helwan [27], inds. (Wassif & Madkour 1963 [as *R. hardwickei*]); Südlich Kairo, 4 inds., SMF (Kock 1969 [as *R. hardwickei*]); Helwan, Maadi (Madkour 1978 [as *R. hardwickei*]); – Kairo [28], 3 m, 1 f, NHMB (Engelmann 1912); Kairo, 1 m, NHMB (Revelliod 1913); La Caire (Gohar 1934 [as *R. microphyllum* Geoffr.]); Cairo Area (Hoogstraal 1952); near Cairo, caves (Hoogstraal 1956 [as *R. hardwickei*]); Cairo area (Hoogstraal 1962 [as *R. hardwickei*]); Cairo, 17 June 1945: 1 ind. (Hopkins & Rothschild 1956 [as *Rhinopoma* sp.]); Cairo, 17 July 1945: 1 ind. (Hubbard 1960 [as *Rhinopoma* sp.]); Mokkattam hills, inds. (Wassif & Madkour 1963 [as *R. hardwickei*]); Cairo, June 1950: 1–2 inds. (Maa 1965); Kairo, 3 inds., ZMH, ZMB (Kock 1969 [as *R. hardwickei*]); Cairo, Bar Kouky [= Sultan Barquq] Mosque, 21 April 1969: obs. a colony of some 50 inds., coll. 2 ma, 5 ms, 8 fa, 3 fs, IVB (Gaisler et al. 1972 [as *R. hardwickei*]); Cairo, Old City, Soltan Barkouky Mosque (Saoud & Ramadan 1976a, 1977d); Cairo, colonies (Madkour 1977b [as *R. hardwickei*]); Cairo, 21 April 1969: 1 ma, 1 fa, IVB (Gaisler & Baruš 1978 [as *R. hardwickei*]); Mokattam Hills (Madkour 1978 [as *R. hardwickei*]); Mokattam, April 1958: 1 f, June 1961: 2 m, ASUC (Wassif et al. 1984 [as *R. hardwickei*]); Cairo, 2 inds., NHMB, ZMUC (Qumsiyeh 1985 [as *R. hardwickei*]); Old City of Cairo, coll. inds. (Ramadan 1986 [as *R. hardwickei*]); Cairo, March 1968: inds. (Uchikawa & Kock 1989 [as *R. hardwickii*]); Cairo (Wassif 1995 [as *R. hardwickei*]); Cairo, Bar Kouky mosque, 21 April 1969: 2 m, 7 f, IVB (Benda et al. 2004a, 2006 [as *R. hardwickii*], 2009, 2014b); El Qahirah, Muqattam, old quarry, 29 January 2010: obs. 1 ind. roosting, 30 January 2010: obs. 2 inds., 20 October 2011: obs. 15 inds. (Benda et al. 2014a); Cairo, buildings, 10 inds. (Morsy et al. 2018 [as *R. hardwickii*]); – Eastern Desert (Wadi Dighla) [29] (Sanborn & Hoogstraal 1955 [as *R. hardwickei*]); Wadi Digla, nine miles east of Maadi, 20 October 1951: inds. (Macy et al. 1961 [as *R. hardwickei*]); Wadi Digla, near Maadi, inds. (Heyneman & Macy 1962 [as *R. hardwickei*]); Eastern Desert caves (Hoogstraal 1962 [as *R. hardwickei*]); Maadi, inds. (Wassif & Madkour 1963 [as *R. hardwickei*]); El-Maadi, July 1961: 1 m, ASUC (Wassif et al. 1984 [as *R. hardwickei*]); Wadi Digla, 2 inds., FMNH (Qumsiyeh 1985 [as *R. hardwickei*]). – E l U q s u r: Erment [30] (Oken 1816 [as *Vespertilio microphyllus* s.l.]); Erment (Geoffroy 1818, 1828 [as *R. microphyllus* s.l.]); Erment (Presl 1834 [as *R. microphyllum* s.l.]); Ermant, in den alten Gebäuden (Fitzinger 1861 [as *R. microphyllum* s.l.]); – Nag Siteih [31], at a water channel, 11 January 2011: det. calls of 2 inds. (Benda et al. 2014a); – Theben [32] (Oken 1816 [as *Vespertilio microphyllus* s.l.]); Thèbes (Geoffroy 1818, 1828 [as *R. microphyllus* s.l.]); Tèby (Presl 1834 [as *R. microphyllum* s.l.]); Theben, in den alten Gebäuden (Fitzinger 1861 [as *R. microphyllum* s.l.]);

s.l.]); Thebes, Tombs of the Kings, 4 f (Anderson 1902 [as *R. microphyllum* s.l.]); Luxor, 1 fa, BMNH (Thomas 1903b); Luxor (Trouessart 1904); Karnak, Big Temple, 26 April 1969: obs. a colony of some 30 inds., coll. 1 ms, 2 fa, 1 f, IVB (Gaisler et al. 1972 [as *R. hardwickei*]); Luxor Temple, 29 April 1969: coll. 1 fa, IVB (Gaisler et al. 1972 [as *R. hardwickei*]); Luxor, Valley of Kings, tomb, 30 April 1969: obs. a colony of some 100 inds., coll. 2 ma, 1 fs, IVB (Gaisler et al. 1972 [as *R. hardwickei*]); Luxor, 20 inds., BMNH, FMNH (Qumsiyeh 1985 [as *R. hardwickei*]); Luxor, 6 inds., BMNH, FMNH, MSNG (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); Luxor (Wassif 1995 [as *R. hardwickei*]); Karnak, Temple, 26 April 1969: 1 m, 2 f, IVB (Benda et al. 2004a, 2006 [as *R. hardwickii*], 2009, 2014b); Luxor, 1 fa, BMNH (Benda et al. 2004a, 2006 [as *R. hardwickii*], 2009, 2014b); Luxor, Valley of Kings, tomb, 30 April 1969: 1 m, IVB (Benda et al. 2004a, 2006 [as *R. hardwickii*], 2009, 2014b); Karnak, Eastern Temple of Rameses II, 19 April 2002: 2 inds., NMP (Benda et al. 2008, 2012b, cf. Hulva et al. 2007); El Uqsir (Thebes), tombs at the main road to the Valley of Kings, 27 January 2010: obs. a colony of ca. 230 inds., coll. 4 ma, 2 ms, 1 mj, 2 fa, 1 fj, NMP, 12 January 2011: obs. a colony of ca. 80 inds., exam. 3 ma, 1 mj, 6 fa (Benda et al. 2014a, b, cf. Benda et al. 2012b); Karnak, Luksor, 11 inds., NMP (Karmáčková 2017); – Wadi Nassim [33], Isna, June 1953: 1 ind. (Maa 1965); Wadi Nassim, 8 inds., FMNH (Qumsiyeh 1985 [as *R. hardwickei*]). – J a n u b s i n a': Feiran Oasis [34], wadi Feiran, garden el Braga, 12 August 2005: rec. 1 ind. of cf. *R. hardwickii* [= *R. cystops*] (Dietz 2005b, Dietz & Maltby 2006); Feiran, El Braga Garden, 12 August 2005: det., rec. & obs. 1 ind. (Benda et al. 2008); Wadi Feiran, July–August 2010: det. calls (Carpenter et al. 2014); – St. Katherine [35], two areas in the vicinity, July–August 2010: det. calls (Carpenter et al. 2014); – Wadi Maghara [36], small cave, 13 February 2012: obs. 1 ind., net. 3 inds. (Carpenter et al. 2014); – Wadi Sa'al [37], July–August 2010: det. calls (Carpenter et al. 2014). – Q e n a: Dendera [38] (Kolenati 1857a [as *R. microphyllum* s.l.]); Denderah, 1897: 11 inds., ZFMK (von Lehmann 1964 [as *R. microphyllum* s.str.]); Dafaga Tempel, Dendera, 6 April 1897: 8 inds., ZFMK (Kock 1969 [as *R. hardwickei*]); Dandara, Temple of Hathor, 27 April 1969: obs. a colony of some 100 inds., coll. 1 ma, 1 ms, 8 fa, 4 fs, IVB (Gaisler et al. 1972 [as *R. hardwickei*]); Dandara, 20 inds., AMNH, MQC, ZFMK (Qumsiyeh 1985 [as *R. hardwickei*]); Dandara, 16 inds., AMNH, CMNH, FMNH, SMNS (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); Dandara, Temple of Hathor, 27 April 1969: 2 m, 10 f, IVB (Benda et al. 2004a, 2006 [as *R. hardwickii*], 2009, 2014b); Dendera, 6 April 1897: 1 m, 3 f, ZFMK (Benda et al. 2006 [as *R. hardwickii*], 2009, 2014b); – Qena [39] (Sanborn & Hoogstraal 1955 [as *R. hardwickei*]); Qena Province (Hoogstraal 1962 [as *R. hardwickei*]); Qena, 1 ind., SMNS (Qumsiyeh 1985 [as *R. hardwickei*]); Qena (Wassif 1995 [as *R. hardwickei*]); Quena province, inds. (El Garhy 2003 [as *R. hardwickei*]). – **Unpublished data:** E l B a h r E l A h m a r: Koseir [= El Qoseir] [40], 1878: 1 ma (ZFMK 79.660 [A]; leg. C. B. Klunzinger).

IMPRECISE RECORDS. Aegypt, 2 inds., ZMB (Lichtenstein 1823 [as *R. microphyllum* Geoffr.]); Egypt (Gray 1838 [as *R. microphylla* Geoffr.]); Egypten (Wagner 1840 [as *R. microphyllum* Geoffr.]); Aegypten, 4 inds., SMF (Rüppell 1842b [as *R. microphyllum* Geoffr.]); Aegyptio (van der Hoeven 1855 [as *R. microphyllum* Geoffr.]); Ägypten (Fitzinger & von Heuglin 1866 [as *R. microphyllum* s.l.]); Aegypten (Hartmann 1868 [as *R. microphyllum* Geoffr.]); Egypte (Trouessart 1879 [as *R. microphyllus* Geoffr.]); Aegypten, 1 ind., KLHB (Nehring 1886 [as *R. microphyllum* Geoffr.]); Aegypten, 1 m, ZMH (Noack 1891 [as *R. microphyllum* s.l.; LAt 54 mm]); Ägyptus (Trouessart 1897 [as *R. microphyllum* Geoffr.]); Ägyptus (Trouessart 1904); Egypte, 1 ma, 1 fa, 3 inds., MNHN (Rode 1941 [as *R. microphyllum* Geoffroy]); Egypt (Theodor & Moscona 1954 [as *R. hardwickei*]); Egypt (Hoogstraal 1955, Theodor 1955, Hoogstraal 1956 [as *R. hardwickei*]); Ägypten (Möhres & Kulzer 1956b [as *R. hardwickei*]); Egypt, 63 inds. (Wells & Randall 1956 [as *R. hardwickei*]); Egypt (Myers et al. 1962 [as *R. hardwickei*]); Egypt, coll. inds. (El Sabban et al. 1967 [as *R. hardwickei*]); Egypt, 1955 & 1956: colony (Theodor 1968 [as *R. hardwickei*]); Ägypten, 21 inds., ZMB (Kock 1969 [as *R. hardwickei*]); Egypt, 7 inds. (DeBlase 1972a [as *R. hardwickei*]); Egypt (Madkour 1976b [as *R. hardwickei*]); Egypt, 1972–1975: 146 inds. (Saoud & Ramadan 1976b [as *R. hardwickei*]); Upper Egypt & Lower Egypt, inds., BMNH (Hill 1977 [as *R. hardwickei*]); A. R. Egypt, inds. (Madkour 1977c [as *R. hardwickei*]); Egypt, numerous inds. (DeBlase 1980 [as *R. hardwickei*]); Egypt, 37 inds., SMNS, USNM, ZMUC (Qumsiyeh 1985 [as *R. hardwickei*]); Egypt, 13 inds., BMNH, IRSN, RNHL, SMF (Van Cakenberghe & De Vree 1994 [as *R. hardwickei*]); Egypt, 1–8 inds. (Badavi & Movsesân 1995 [as *R. hardwickei*]); Egypt, 6 m, 8 f (Riad et al. 2000 [as *R. hardwickei*]); Egypt, 3 inds., NMP (Benda et al. 2008); Egypt, 2 inds., YPM (Dornburg et al. 2011 [as *R. hardwickii*]). – Lower Egypt, 7 inds., BMNH (Thomas 1913a). – Nile Valley in Egypt, 16–31 October 1979: coll. 20 inds. (Simmons et al. 1984 [as *R. hardwickei*]). – Nubia (Fitzinger & von Heuglin 1866, Hartmann 1868 [as *R. microphyllum* s.l.]); Nubia (Flower 1932 [as *R. microphyllus* s.l.]). – vicinity of Cairo [26–29] and Giza [17–23] Province, October 1959 – October 1961: 12 inds. (Mohammed & Saoud 1965).

DISTRIBUTION. *Rhinopoma cystops* represents a rather common bat species in Egypt, it has been documented from 40 localities (Fig. 8; Table 2). Most of the records are concentrated to two geographic regions of Egypt, the Cairo Region and Nile Valley, several record sites are available from Sinai, and one site is known from each of the Western Desert (Wadi El Natrun) and the Red Sea shore (El Qoseir). In the Nile Valley, *R. cystops* represents the most common bat species (and

most probably, a majority of the geographically unspecified records of *R. cystops* from Egypt also originate from this area), and in the Cairo Region, the third most common species (Table 2). In the former region, the available records are scattered regularly along the whole Egyptian length of the Nile.

The Egyptian records of *R. cystops* are available from a very wide altitude range of –10–1685 m a. s. l. (median 76.0 m, mean 189.3 m; Fig. 4, Table 3). However, the localities in the continental African part of Egypt lie in a very narrow range of lowland altitudes (–10–209 m a. s. l.; median 72.0 m, mean 78.3 m), while the Sinaitic records come from a wide altitude range of 288–1685 m a. s. l. (median 905.0 m, mean 988.6 m; Fig. 5, Table 4). Thus, the continental and Sinaitic altitude ranges do not overlap and represent two separate distribution types in the lowland and mountainous zones.

The current picture of *R. cystops* distribution in Egypt conforms to the view given by Qumsiyeh (1985) in the two regions of the most common occurrence and in the Western Desert. However, the evidence of this bat from Sinai and the Red Sea shore were not available to this author.

Similarly as in the case of *R. microphyllum*, the reports available from the 19th century cannot be easily affiliated with one of the two Egyptian species of the genus, since until the taxonomic revision by Thomas (1903b) only one *Rhinopoma* species was generally reported from the country (although already Geoffroy 1818 noted two species from Egypt). Therefore, the old unidentifiable reports are here attributed to a non-specific name *R. microphyllum* s.l. The identification of species in the modern sense is possible only in the cases when the author gives any character which helps to distinguish between the two species, like a body measurement. However, such cases are very rare; besides the records from three sites mentioned by Anderson (1902), i.e., Pyramids of Gizeh (9 bats), Aswan (9), and Thebes (4) (see under *R. microphyllum* for details), only the specimens reported by Geoffroy (1818) and Noack (1891) were accompanied by body dimensions indicating *R. cystops*. However, the MNHN series of five bats collected by Geoffroy (1818) that are not directly assigned to localities (all are labelled ‘Egypte’), comprises a mix of both *Rhinopoma* species (Van Cakenberghe & De Vree 1994, own obs. 2004), and thus the particular localities could not be affiliated to a certain species. Noack (1891) reported a ZMH specimen of *Rhinopoma* with the forearm length of 54 mm and thus, representing *R. cystops*.

Nevertheless, since the records of *R. cystops* in Egypt are approximately three times more numerous than those of *R. microphyllum*, the records of *R. microphyllum* s.l. were here included into the record list of *R. cystops*. Moreover, in the prevailing majority of the localities with records of *R. microphyllum* s.l., the presence of *R. cystops* was additionally confirmed by other authors (see above), only in five sites *R. microphyllum* s.l. was reported entirely; viz. Kom Ombo and Erment (Geoffroy 1818), the Crocodile Cave at Manfalut (Brehm 1864), Gebel Ter (Hartmann 1868), and Beni Hassan (Gurney 1876, Anderson 1902), see Fig. 8.

The occurrence of *R. cystops* in Egypt continues in all directions to other segments of its distribution range. It directly continues with numerous records in the Nile Valley of Sudanese Nubia (Koopman 1975, Van Cakenberghe & De Vree 1994, Benda et al. 2014b) and with abundant occurrence in the Holy Land (Mendelssohn & Yom-Tov 1999, Benda et al. 2010). In the west, the occurrence of *R. cystops* creates isolated spots throughout the Sahara, both in its marginal and inner parts (Puechmaille et al. 2012, Benda et al. 2014b, Ahmim & Oubaziz 2017, Aulagnier et al. 2017). The only record of this bat from Libya was made in the oasis of Al Jaghbub within a broader extent of the Siwa Basin, some 28 km west of the Egyptian border (Benda et al. 2004a). This record indicates a possible distribution of *R. cystops* also in the Siwa Oasis and other oases of the Western Desert of Egypt, where however its records are missing despite a rather intensive research (see Benda et al. 2014a).

TAXONOMY. Although the populations of small-sized *Rhinopoma* of North Africa including Egypt are currently considered to represent *R. cystops* (Benda et al. 2008, 2014a, b, Puechmaille et al. 2012, Ahmim & Oubaziz 2017, Aulagnier et al. 2017, Horáček 2019), the taxonomic history of these populations is not straightforward. The confusions of names and taxa occurred frequently, namely due to morphological uniformity of the family, and simultaneously, size plasticity of particular populations (see also under *R. microphyllum* above).

Originally, a single species was recognised within the genus in Egypt, *R. microphyllum*. However, while Brünnich (1782) described under the latter name the large-sized species, Geoffroy (1818) applied this name for both species, small- and large-sized (Van Cakenberghe & De Vree 1994) but published only the data on the small-sized species (Fig. 9). Although Geoffroy (1818) reported M. T. Brünnich as an original author of the species description, the description of the small-sized species has been generally attributed to Geoffroy and this species was named *R. microphyllum* Geoffroy (see e.g., Lichtenstein 1823, Gray 1838, Wagner 1840, Rüppell 1842b, van der Hoeven 1855, Frauenfeld 1856, Hartmann 1868, Dobson 1878, Trouessart 1879, 1897, Nehring 1886, Loos 1896, Becker 1903, Gohar 1934, Rode 1941). This erroneous interpretation caused a long-lasting confusion in the taxa naming. Various authors stressed a large body size variability in *Rhinopoma* or even a possible existence of two size-defined forms in north-eastern Africa (Oken 1816, Geoffroy 1818, Desmarest 1820, Peters 1859, Fitzinger & von Heuglin 1866, von Heuglin 1877) and created names to denote these size variations, viz. *brevicaudatum* Oken, 1816, *ferox* Hemprich, 1821, *brevicauda* Hemprich, 1821, *lepsianum* Peters, 1859, *sennaariense* Fitzinger, 1866, *longicaudatum* Fitzinger, 1866, *cordofanicum* von Heuglin, 1877. However, most of these names are unavailable for taxonomy (nomen nudum, manuscript name; see Koopman 1975, Van Cakenberghe & De Vree 1994), except of two of them, *lepsianum* Peters and *cordofanicum* von Heuglin. However, the latter two names were shown to be junior synonyms of *microphyllum* Brünnich (Thomas 1903b, Hill 1977, Van Cakenberghe & De Vree 1994).

The situation was finally solved by Thomas (1903b), who identified two size-defined morphotypes of *Rhinopoma* to live in sympatry in Egypt, specified them morphologically, and recognised a need to name one of them; see as follows (p. 496): “By Dobson [1878 ...], the members of this genus [*Rhinopoma*], whether from Egypt or India, were all combined under one heading, *R. microphyllum*, “Geoffroy,” although both Peters [1859] and [von] Heuglin [1877] had pointed out that in Egypt [= Egypt and the Sudan] two forms were present, a larger and a smaller, the former having the tail shorter than the forearm, the latter longer. // But in giving new names the two German authors, misled by their belief that Geoffroy’s measurements were the original ones, affixed the names to the larger form. Now, however, that Anderson [1902 ...] has drawn attention to the fact that it was Brünnich [1782], and not Geoffroy [1818], who first described the species, I am able to state, on measurements kindly furnished me by Dr. Winge, that the type, still preserved in the Copenhagen Museum, is the large form with short tail (forearm 67.5 millim., tail 61). The smaller one, as to whose distinction from the larger no one who had compared the skulls could doubt for one moment, will therefore require a new name, and may be called // *Rhinopoma cystops*, sp.n.”

This description of a new species is based on a BMNH specimen of adult female, collected by Nathaniel Charles Rothschild (1877–1923) and his company at Luxor, perhaps during his trip to the Sudan in 1901 (de Winton 1901b, Thomas 1903b). ‘Luxor, Egypt’ [25°42’00”N, 32°38’22”E] is thus the universally mentioned type locality of *R. cystops* (Hollister 1918, Flower 1932, Allen 1939, Setzer 1952, Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Harrison 1964, Kock 1969, Gaisler et al. 1972, Koopman 1975, Atallah 1977, Hill 1977, Corbet 1978, Qumsiyeh 1985, 1996, Qumsiyeh & Knox Kones 1986, Van Cakenberghe & De Vree 1994, Benda et al. 2006, 2017, Lanza et al. 2015, Horáček 2019). Thomas (1903b: 497) erroneously defined the type



Fig. 9. Images of *Rhinopoma microphyllus* Geoffroy, 1818 [= *R. microphyllum* s.l.], *Nycteris Thebaïcus* Geoffroy, 1813 [= *N. thebaica*], and *Vespertilio pipistrellus* [Schreber, 1774] (la pipistrelle d'Égypte) [= *Pipistrellus kuhlii* (Kuhl, 1817)] published by Geoffroy (1818: Plate 1).

locality as ‘Luxor, Lower Egypt’, although Luxor is situated in the middle of Upper Egypt; this mistake was corrected by Flower (1932: 385: ‘Luxor, Upper Egypt’), while the original erroneous variation was quoted only exceptionally (Hollister 1918, Horáček 2019).

The sympatric occurrence of two *Rhinopoma* species in north-eastern Africa was then accepted and the name *R. cystops* applied for the small-sized species (Schwann 1905, Bonhote 1909, Hollister 1918, Flower 1932, Allen 1939, Setzer 1952). Bonhote (1909: 789) first reported their syntopic roosting, in a cave at Abu Rawash. Originally, the sharing of one roost by both size forms was an argument used for a support of extreme age variation rather than an intrageneric polymorphism in *Rhinopoma**.

While three subsequent taxonomic papers by Thomas (1903b, 1913a, 1920) brought the content of the genus *Rhinopoma* split into seven separate species, including *R. cystops* distributed in northern and north-eastern Africa, western Arabia and the Levant, Ellerman & Morrison-Scott (1951) and Felten (1962) suggested to arrange all nominate taxa of *Rhinopoma* into only two species. Under the latter conception, the Egyptian populations of the small-sized *Rhinopoma* were considered to be a part of the Asian species *R. hardwickii* Gray, 1838 (also spelled in an emended form *hardwickei*), as its Afro-Arabian subspecies *R. hardwickii cystops*. This view was followed by other authors (Sanborn & Hoogstraal 1955, Hoogstraal 1962, Hayman & Hill 1971, Atallah 1977, Corbet 1978). A modification was brought by Kock (1969), who compared morphometric data on large population sets from north-eastern Africa and found two size categories within the small-sized species (*R. hardwickii*) in this region, a small-sized form occurring in the central parts of the Sahara (central and southern Egypt, northern Niger, and southern Algeria) and a large-sized form in the less arid areas of northern Africa (northern Egypt, Tunisia, northern Algeria, Morocco, Sudan, southern Niger, Mauritania) and western Arabia. Hence, the Egyptian populations of *R. hardwickii* fell into two subspecies according to this opinion, Kock (1969) co-identified the small-sized form with *R. hardwickii cystops* and the large-sized form with *R. h. sennaariense* Fitzinger, 1866, a name based on a material collected at the Blue Nile of the Sudan (Fitzinger & von Heuglin 1866).

This geographic and morphometric bimodality of the Egyptian populations (and the North African as well) of *R. hardwickii* was broadly adopted as a valid taxonomic arrangement of the species for a long time (Gaisler et al. 1972, Koopman 1975, Hill 1977, Qumsiyeh 1985, 1996, Qumsiyeh & Knox Kones 1986, Van Cakenberghe & De Vree 1994, Horáček et al. 2000). Only two nomenclatural modifications occurred in this conception. Koopman (1975) pointed out that the name *sennaariense* Fitzinger remains an unavailable nomen nudum, and suggested to use *cordofanicum* von Heuglin, 1877 for naming of the large-sized Afro-Arabian populations of *R. hardwickii*. However, this opinion was rejected by Hill (1977), who demonstrated the von Heuglin’s name to be rather a junior synonym of *R. microphyllum* (contra Kock 1969, Koopman 1975, but in accordance with Thomas 1903b, Qumsiyeh 1985, Van Cakenberghe & De Vree 1994, Simmons 2005), and named the large-sized populations as *R. hardwickii arabium* Thomas, 1913 instead. The latter name was based on bats from Yemen to assign populations of *R. cystops* of western Arabia and the Levant (Thomas 1913a). Then, *R. h. cystops* was recognised in the southern

* NOTE. Anderson (1902) considered the Egyptian *Rhinopoma* to represent a single species, *R. microphyllum*. However, he noted the extreme body size variation in this genus that he considered a manifestation of an age variation rather than any other type of variability, perhaps due to the presence of these size variations in a common roost; see as follows (p. 146): “The fact that the smallest and also the largest Egyptian males are from one and the same tomb, the series of measurements ranging from 49 to 71 mm. are merely indicative of difference of age.” Later, Flower (1932: 385) saw this point also rather problematic, see as follows: “Oldfield Thomas considered that two species of Long-tailed Bats, a larger *microphyllus* of Brünnich and a smaller *cystops* of Thomas, inhabited Egypt. This may be so, and if so the two species are found together in the same caves on the same days. Personally I am unable to distinguish *cystops* as a separate species.”

part of Egypt, from the Qena Province (incl.) southwards, and *R. h. arabium* in northern Egypt, theoretically also including Sinai.

However, this arrangement has been recently challenged by the results of a series of molecular genetic analyses (Hulva et al. 2007, Benda et al. 2012b, 2019) of the *Rhinopoma* samples of south-western Asia and north-eastern Africa, including Egypt. The results rather surprisingly demonstrated the morphometric differences among populations being not reflected in their phylogenetic relationships. The former species rank of *R. hardwickii* s.l. (sensu e.g., Van Cakenberghe & De Vree 1994, Horáček et al. 2000, and/or Simmons 2005), was split into two species, Irano-Indian *R. hardwickii* s.str. and Afro-Arabian *R. cystops*, separated from each other by a deep genetic distance of 8–9% in a mitochondrial marker (cytochrome *b*). The latter species was again split into the North African subspecies, *R. c. cystops*, occurring in the Maghreb, Libya, Egypt and the Sudan, and the mainly Arabian subspecies, *R. c. arabium*, distributed from the Levant in the north to western Oman in the east and eastern Ethiopia in the south-west. The latter two lineages were separated by a genetic distance of ca. 3% from each other, supporting their subspecies statuses. The Saharan and supra-Saharan populations of *R. cystops*, including those of northern and southern Egypt, thus belong to a single taxon, *R. c. cystops* (Horáček 2019). The considerable phenotypic plasticity within *R. cystops*, which apparently is not a direct consequence of phylogeographic history, rather seems to reflect of local climatic conditions (Benda et al. 2006, Hulva et al. 2007). After all, similar polymorphism in size characters among populations across the Sahara and surrounding regions was observed in some other desert bat species, viz. *Asellia tridens* and *Pipistrellus kuhlii*, presenting a similar phylogenetic figure (see below).

Rhinolophus clivosus Cretzschmar, 1828

RECORDS. Published data: A s w a n: Aswan [1], tunnel under railway, 24 January 2010: net. 1 ma, NMP (Benda & Vallo 2012, Benda et al. 2014a, 2017); Aswan, 1 ind., NMP (Karmáčková 2017); – E l A' a q a b [2], under a road bridge, 25 January 2010: net. 1 fa, NMP (Benda & Vallo 2012, Benda et al. 2014a, 2017); E l A A q a b, 1 ind., NMP (Karmáčková 2017); – K o r o s k o [3], 1 ma, BMNH (Andersen 1906 [as *R. acrotis*]); Korosku (Hoogstraal 1962); Korosko, 1 ind., BMNH (Qumsiyeh 1985); Korosko, Alto Egitto, 1 m, MSNG (Benda & Vallo 2012, Benda et al. 2017). – E l B a h r E l A h m a r: eastern desert of Egypt [4], near the Soudan frontier, about lat. 22° and long. 35°, 3 August 1903: 1 m, 3 inds., BMNH (Thomas 1904 [as *R. Andersonii*]); Eastern Egyptian Desert, about 22° N., 35° E, 1 m, 3 inds., BMNH (Andersen 1904, 1905a, 1906 [as *R. acrotis*]); eastern desert of Nubia at 2000 feet elevation, in or near the Wadi Alagi, about 22° N. by about 35° E., July 1903: 5 inds. (Flower 1932 [as *R. acrotis*]); Wadi Alagi, 5 inds., BMNH (Koopman 1975); Wadi Alagi, 5 inds., BMNH (Qumsiyeh 1985); Wadi El Alaqi (Wassif 1995); E. Egypt Desert, 22°N, 35°E, 3 August 1903: 1 m, BMNH (Benda & Vallo 2012, Benda et al. 2017); – W e s t o f A b u R i h a l [5], 90 km E of Idfu, 1 m, NMP (Benda et al. 2008, 2017, Benda & Vallo 2012). – E l B e h e i r a h: Western Desert (Wadi Natroun) [6] (Sanborn & Hoogstraal 1955); Wadi Natroun (Hoogstraal 1962); Wadi El Natrun, 3 inds., FMNH, USNM (Qumsiyeh 1985); Wadi El Natrun (Wassif 1995). – E l F a y u m: Faiyum [7] (Sanborn & Hoogstraal 1955); caves near Kom Aushim, 25 May 1950: inds. (Macy et al. 1961); Kom O-Shim, caves, inds. (Heyneman & Macy 1962); Faiyum (Hoogstraal 1962); Kom Oshim, 4 inds., FMNH, USNM (Qumsiyeh 1985); Faiyum (Wassif 1995). – E l J i z a h: Abu Rauwash [8], 12 March 1951: inds. (Macy et al. 1961); Abu Rawash, 14 May 1951: 1–2 inds. (Theodor 1967 [as *R. acrotis*]); Abu Rawash, 10 inds., March 1941: 1 m, August 1946: 3 m, November 1953: 1 m, August 1954: 6 m, December 1959: 1 m, March 1966: 2 m, 3 f, March 1967: 1 f, ASUC (Wassif et al. 1984); Abu Rawash, 135 inds., FMNH, USNM, ZFMK (Qumsiyeh 1985); Kairo, Aburawash, 15 April 1959: 24 m, 1 f, NMP, ZFMK (Benda & Vallo 2012, Benda et al. 2017); – A b u S i r [9], 29 inds., FMNH (Qumsiyeh 1985); – E l M a n s u r i y a [10], 3 inds., USNM (Qumsiyeh 1985); – 4 km W El Mansuriya [11], 11 inds., FMNH (Qumsiyeh 1985); – P y r a m i d e n z u K a i r o [= El Jizah] [12] (Kolenati 1863); pyramides de Ghizeh, 1 ind. (Looss 1896 [as *R. hippocrepis*]); Second Pyramid at Gizeh, 1 m (Anderson 1902 [as *R. antinorii*]); Gizeh, Zoological Gardens, September 1901: 1 f (Anderson 1902 [as *R. antinorii*]); Ghizeh, 1 fs, 16 December 1891: 1 ma, BMNH (Andersen 1905a [as *R. acrotis*]); Gizeh, 1 m (Senna 1905 [as *R. antinorii*]); Giza, 3 ma, 1 fs, BMNH (Andersen 1906 [as *R. acrotis*]); Giza Gardens, 1 m (Bonhote 1909 [as *R. acrotis*]); ‘Kairo’ (Odhner 1910 [as *R. hippocrepis*]); Giza, Kedah House, 4 August 1901: 1 f (Flower 1932 [as *R. acrotis*]); Giza Zoological Gardens, Lion House, 23 April 1903: 1 ind. (Flower 1932 [as *R. acrotis*]); Pyramids of Giza, 3 m, 1 ind., USNM (Setzer 1952 [as *R. acrotis*]); Giza Pyramid, 18 June 1951: inds. (Macy et al. 1961); Giza Pyramids and nearby mastabas, inds. (Heyneman & Macy 1962); Giza (Hoogstraal 1962); Giza, pyramids,

20 June 1971: 2 m, 1 f, MUB (Gaisler et al. 1972); Giza (Baruš 1973); Giza City, 6 inds., BMNH (Qumsiyeh 1985); Giza Pyramids, 42 inds., BMNH, FMNH, MVZ, USNM (Qumsiyeh 1985); Giza Governorate, coll. inds. (Ramadan 1986); Giza, pyramids, 20 June 1971: 2 m, 1 f, IVB (Benda et al. 2008); Ghizeh, 16 December 1891: 1 m, BMNH (Benda & Vallo 2012, Benda et al. 2017); – Sakkara [13], steppe pyramid, the “Prison of Joseph” catacombs, 23 April 1969: 1 m, IVB (Gaisler et al. 1972); Saqqara, 1 ind., SMF (Felten et al. 1977); Sakkara (Madkour 1978); Sakkara, December 1966: 1 m, 1 f, ASUC (Wassif et al. 1984); Saqqara, 17 inds., USNM (Qumsiyeh 1985); Sakkara presso il Cairo, 5 May 1906: 1 m, MSNG (Benda & Vallo 2012, Benda et al. 2017); Saqqara, 14 June 1971: 1 m, SMF (Benda & Vallo 2012, Benda et al. 2017); – Serapeum [14], 1 ind., BMNH (Qumsiyeh 1985). – E l Q a h i r a h: Cairo [15], 2 ma, MSNG (Doria 1887); Near Cairo, October 1902: 1 m (Anderson 1902 [as *R. antinorii*]); Cairo, 1 ma, MSNG (Andersen 1906 [as *R. acrotis*]); Cairo (Hoogstraal 1962); Cairo, 2 inds., HZM, NHMB (Qumsiyeh 1985); Gebel Mukattam, 1 ind., SMNS (Qumsiyeh 1985); – Massarah [16], 1 m, NHMB (Engelmann 1912 [as *R. Antinorii*]); Massarah, n. Kairo, 1 ind., NHMB (Qumsiyeh 1985). – E l Q a l y u b i y a h: Delta Barrage [17], 4 March 1911: 1 m (Bonhote 1912, Flower 1932 [as *R. acrotis*]); Delta Barrage, 1 ind., BMNH (Qumsiyeh 1985). – E l U q s u r: Luxor [18], 2 inds., FMNH (Qumsiyeh 1985). – E s S u w a i s: Suez [19], BMNH (Csorba et al. 2003). – J a n u b S i n a’: Beer il Abed [20], small house, 29 July 2006: obs. 1 ind. (Dietz & Maltby 2006); Wadi Klar, house and pit of church next to Toot tree, 29 July 2006: obs. 4 inds. (Dietz

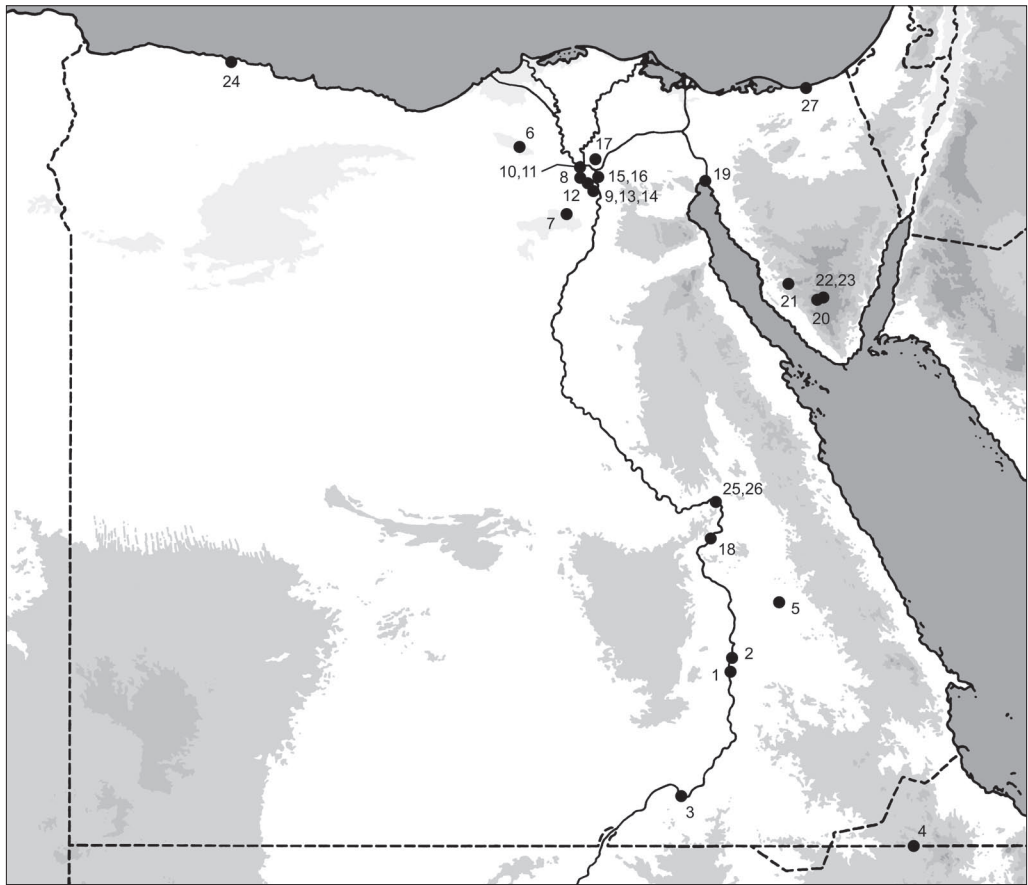


Fig. 10. Records of *Rhinolophus clivosus* Cretzschmar, 1828 in Egypt; for explanations see Fig. 3.

& Maltby 2006); Wadi Shagg, 29 July 2006: 5 inds. (Dietz & Maltby 2006); Bir El Abed, small house, 29 July 2006: obs. 1 ind. (Benda et al. 2008); Bir El Abed, Wadi Shagg, in the old church on the border between Wadi Shagg and Wadi Klar, 29 July 2006: obs. 5 inds., net. 1 fa, 1 fs (Benda et al. 2008); – Feiran Oasis [21] (Sanborn & Hoogstraal 1955); Feiran Oasis, hillside caves (Hoogstraal 1962); Feiran Oasis, 9 inds., FMNH (Qumsiyeh 1985); Feiran Oasis (Wassif 1995); Feiran Oasis, Wadi Feiran, garden el Braga, 10 August 2005: net. 2 fa, 1 fs, 11 August 2005: obs. & rec. 1 ind., 12 August 2005: obs. & rec. 2 inds. (Dietz 2005b, Dietz & Maltby 2006); Feiran, garden, 10 August 2005: net. 2 fa, 1 fs, CDIS, 11 August 2005: det. & rec. 1 ind., 12 August 2005: det. & rec. 2 inds., 10 September 2005: net. 1 fa, NMP, det. & rec. min. 2 inds. (Benda et al. 2008, 2017, Benda & Vallo 2012); – Wadi Klar [22], a house next to the Toot Tree, 2 August 2006: net. 1 fa, 1 fs (Dietz & Maltby 2006); Wadi Shagg/Wadi Klar, Hajsalem's garden, deserted house, 4 August 2006: net. 2 fa (Dietz & Maltby 2006); Wadi Klar, old church, 2 August 2006: net. 1 fa, 1 fj (Benda et al. 2008); Wadi Klar, deserted house W of Hajsalem's Garden, 4 August 2006: net. 2 fa (Benda et al. 2008); – Wadi Talaah [23], 300 km south of El-Arish, August 1943: 4 f (Wassif 1953 [as *R. acrotis*]); Wadi Talaah, near St. Catherine's monastery, large cave, August 1943: coll. 4 f (Wassif & Hoogstraal 1954 [as *R. acrotis*]); St. Catherine (Wassif 1995). – M a t r u h: 20 miles west of Mersa Matruh [24] (Hoogstraal 1962); 20 mi. W. Mersa Matruh, 5 August 1959: 1 ind. (Radovsky 1967); 20 mi. W Mersa Matruh, 4 inds., FMNH (Qumsiyeh 1985). – Q e n a: Dendera [25] (Kolenati 1863); – Qena [26] (Sanborn & Hoogstraal 1955); Qena (Hoogstraal 1962). – S h a m a l S i n a': El-Arish [27], storehouse, summer 1951: obs. a colony of more than 200 inds., coll. 5 m, 37 f (Wassif 1953 [as *R. acrotis*]); El Arish (Sanborn & Hoogstraal 1955); Arish, hillside caves (Hoogstraal 1962); El-Arish, July 1944: 2 f, August 1951: 5 m, 17 f, September 1951: 2 m, 4 f (Wassif et al. 1984); Al Arish, 3 inds., USNM (Qumsiyeh 1985); El Arish (Wassif 1995).

IMPRECISE RECORDS. Égypte (Temminck 1835); Egypt (Gray 1838 [as *R. Capensis*]); Égypten (von Keyserling & Blasius 1839); Égypten (Wagner 1840); Égypte (Gervais 1854); Aegypten (Wagner 1855 [as *R. clivosus* and *R. capensis*]); Aegypten (Kolenati 1856, 1857a, c, 1860a, Blasius 1857); Ägypten (Kolenati 1859a, b, 1860b, von Heuglin 1861b); Ägypten (Fitzinger & von Heuglin 1866 [as *R. clivosus* and *R. capensis*]); Aegypten, in Ruinen und bewohnten Häusern (Hartmann 1868 [as *R. ferrum equinum* and *R. capensis*]); durch ganz Ägypten (Fitzinger 1870a); Égypten (von Heuglin 1877 [as *R. clivosus* and *R. capensis*]); Égypte, 2 inds., RNHL (Jentink 1887); Égypte, 4 inds., RNHL (Jentink 1888 [as *R. ferrum-equinum* and *R. clivosus*]); Aegypten, 1 ind. (Speiser 1901 [as *R. ferrum-equinum*]); Aegyptus (Bezzi 1905 [as *Rhinolophus ferrum equinum*]); Egypt (Hirst 1923); Égypte (Gohar 1934 [as *R. hippocrepis*]); Egypt (Theodor & Moscona 1954 [as *R. acrotis*]); Egypt (Hoogstraal 1955, Hoogstraal 1956); Egypt (Myers et al. 1962 [as *R. acrotis*]); Aegypt (Hürka 1964); Egypt, coll. inds. (El Sabban et al. 1967 [as *R. acrotis*]); Egypt, some inds. (DeBlase 1972a); Egypt (Madkour 1976b); Egypt, 1972–1975: 1 ind. (Saoud & Ramadan 1976b, 1977d); A. R. Egypt, inds. (Madkour 1977c); Égypt, 6 inds., USNM (Qumsiyeh 1985); Egypt, 2 inds. (Riad et al. 2000); Egypt, 1 ind., YPM (Dornburg et al. 2011); Egypt, 1 ind. (Stoffberg et al. 2012). – Nubien (Wagner 1840, 1855, Kolenati 1956, 1860a, von Heuglin 1861b); Nubien (Hartmann 1863, 1868 [as *R. ferrum equinum*]); Nubien (Fitzinger & von Heuglin 1866, Fitzinger 1870a, von Heuglin 1877); Nubia (Flower 1932 [as *R. acrotis*]). – Sinai, 8 inds., ZFMK (von Lehmann 1964 [as *R. acrotis*]). – Peträische Arabien (von Heuglin 1861b, Fitzinger & von Heuglin 1866).

DISTRIBUTION. *Rhinolophus clivosus* represents a medium-frequent bat species in Egypt, it has been documented from 27 sites (Fig. 10; Table 2). It was found in all geographic regions of Egypt except for the Nile Delta; considering the number of reported localities, *R. clivosus* is one of the most frequent bat species in the Cairo Region, from where more than a third of the Egyptian records of this bat originate (Table 2). It is also a frequent bat of the Nile Valley, and the records are available in most of the Nile length in Egypt – Faiyum Oasis and the southern half of the Egyptian Nile Valley (Fig. 10). Five records are known from Sinai and three records from the Red Sea shore and mountains.

The Egyptian records of *R. clivosus* come from a very wide altitude range of –10–1850 m a. s. l. (median 70.0 m, mean 274.7 m; Fig. 4, Table 3). The localities in the continental African part of Egypt lie in a rather narrow range of altitudes (–10–510 m a. s. l.; median 58.0 m, mean 85.7 m), while the Sinaitic records come from a very wide altitude range of 16–1850 m a. s. l. (median 1455.0 m, mean 1106.2 m; Fig. 5, Table 4). Although the continental and Sinaitic altitude ranges largely overlap, they represent different distribution types; whilst *R. clivosus* occurs in lowland and submontane altitudes in the continent, it lives mostly in mountains in Sinai.

Hoogstraal (1962) reported a record from a locality some 35 km west of Marsa Matruh, on the Mediterranean shore in north-western Egypt; this site lies about 350 km west of Wadi El Natrun, the closest Egyptian locality of this species. However, it is situated only 170 km east of

Al Bardiya in the north-eastern corner of Libya, the easternmost known point of occurrence of *R. horaceki* Benda et Vallo, 2012 (Benda et al. 2014b), a species morphologically very similar to *R. clivosus* (Benda & Vallo 2012). Since the landscape west of Marsa Matruh resembles rather that at of Al Bardiya than that in the broader region of the Cairo agglomeration, and due to a relatively close proximity of Marsa Matruh to Al Bardiya, it is possible that the Hoogstraal's (1962) record represents rather *R. horaceki* than *R. clivosus* (see also Benda et al. 2014b). However, this could be solved only with the help of a detailed examination of the respective FMNH specimens* (cf. Qumsiyeh 1985).

The current picture of distribution of *R. clivosus* in Egypt fully conforms to the view given by Qumsiyeh (1985), just the numbers of records in particular regions have increased slightly (namely in the Nile Valley and Sinai).

Due to a rather complex taxonomy of *R. clivosus* (see below), the distribution range of this bat in Egypt comprises three separate segments that correspond to three traditionally recognised taxa. The occurrence in the Cairo Region and Nile Valley has been considered to pertain to the subspecies *R. c. brachygnathus* and this range represents a prevailing distribution area of this taxon. It continues to the south, where however only a single record was reported from Abd el Quadir near Wadi Halfa, Sudan (Bauer 1963), ca. 30 km south of the Egyptian border; a separate range of this subspecies is situated in the central Sahara, in south-eastern Algeria and south-western Libya (Bernard & Happold 2013a). Qumsiyeh (1985) regarded the specimens collected west of Marsa Matruh to be a part of *R. c. brachygnathus* Andersen, 1905, however, this view needs a revision (see above). The occurrence spot of *R. clivosus* in Sinai is traditionally regarded to be the westernmost part of the range of the nominotypical form of this species, otherwise continuing in its distribution to the southern Holy Land (Mendelssohn & Yom-Tov 1999, Benda et al. 2010) and western and southern Arabia (Harrison & Bates 1991, Benda & Vallo 2012, Aloufi et al. 2016). The record from Wadi El Allaqi in mountains of the Halaib Triangle in south-eastern Egypt (Thomas 1904) represents the northernmost extension of the distribution range of *R. c. acrotis* von Heuglin, 1861, a form that inhabits mainly the Ethiopian Highlands and adjacent mountain ranges of north-eastern Africa (Benda & Vallo 2012, Bernard & Happold 2013a).

TAXONOMY. In the course of history, particularly during the 19th century, the Egyptian populations of *Rhinolophus clivosus* were assigned to various species names by various authors, and moreover, by some of these authors to more than one species. First and most frequently, the name *R. clivosus* was used for assignation of the horseshoe bats of Egypt, immediately after the species description was published (Temminck 1835, von Keyserling & Blasius 1839, Wagner 1840, 1855, Gervais 1854, Kolenati 1856, 1857a, c, 1859a, b, 1860a, b, 1863, Blasius 1857, von Heuglin 1861b, 1877, Fitzinger & von Heuglin 1866, Fitzinger 1870a, Doria 1887, Jentink 1887, 1888).

However, Wagner (1855), Fitzinger & von Heuglin (1866), and von Heuglin (1877) reported also *R. capensis* Lichtenstein, 1823 along with *R. clivosus* from Egypt, while Jentink (1888) mentioned *R. ferrumequinum* (Schreber, 1774) besides *R. clivosus* from Egypt. The idea of the occurrence of *R. capensis* in North Africa was introduced by Gray (1838); however, this species is an endemic of the south-western part of South Africa (Monadjem et al. 2020) and its record in a different part of the continent is quite improbable. On the other hand, *R. ferrumequinum* is a bat currently known to occur in the areas neighbouring Egypt, in northern Israel and western Libya

* NOTE. Csorba et al. (2003) placed the locality Matruh to Yemen (with the coordinates 15°11'N, 48°19'E) instead of Egypt. Most probably, this is an error, since the FMNH specimens from near of Mersa Matruh, Egypt, were examined and published more times, see Hoogstraal (1962), Radovsky (1967), and Qumsiyeh (1985). However, if the respective specimens really originate from Matruh of Yemen, the distribution gap between the Egyptian and Libyan ranges of *R. clivosus* and *R. horaceki* is significant, ca. 520 km as the crow flies.

(Mendelssohn & Yom-Tov 1999, Benda et al. 2014b) and its occurrence in Egypt thus cannot be excluded completely. However, this bat was first reported from Egypt and Nubia by Hartmann (1863) and the species was again reported only by few other authors, and in each case without a reference to a specimen and/or precise locality (Hartmann 1868, Jentink 1888, Speiser 1901, Bezzi 1905); the occurrence of *R. ferrumequinum* in Egypt was excluded already by Andersen (1905b). The name *R. ferrumequinum* was mentioned from Egypt also under its junior synonym, *R. hippocrepsis* Schrank, 1798 (Looss 1896, Odhner 1910, Gohar 1934), based on a specimen collected from the pyramids of Giza (Looss 1896); however, besides the collecting site, this specimen had not been specified in another way and its real species affiliation can be only estimated. Additionally, Hartmann (1868) reported two horseshoe species similar to *R. clivosus* from Egypt, *R. ferrumequinum* and *R. capensis*, although *R. clivosus* per se was not mentioned by him.

Due to ambiguous initial taxonomic understanding of *R. clivosus*, it cannot be excluded that another species of the genus *Rhinolophus* Lacépède, 1799 of Egypt was sometimes affiliated to this name, namely *R. mehelyi*. The real position of *R. clivosus* within the genus was elucidated only by Peters (1866), who revised the type specimen of this bat and found it different from the European populations then assigned to it (which he described as a separate species, *R. blasii* Peters, 1866). So, although it is not clear whether all mentions of *R. clivosus*, *R. capensis*, *R. ferrumequinum*, and *R. hippocrepsis* refer to real bat specimens (some old reports could just expect the occurrence of the respective species in Egypt) and/or to which real species of Egypt these mentions refer (*Rhinolophus clivosus*, *R. mehelyi*, or e.g., *Asellia tridens*), here these mentions are tentatively assigned to *R. clivosus* (see also Anderson 1902).

Since *R. clivosus* was described by Cretzschmar (1828: 48) from Arabia (the type locality is ‘Mohila’ [= Al Muwaileh, north-western Saudi Arabia; 27°40’56”N, 35°28’33”E]), this species was considered by some authors as a strictly Arabian (= Asian) bat that does not occur in Africa. Therefore, some other species names appeared to assign the Egyptian populations of *R. clivosus* in its current sense. Anderson (1902), Senna (1905), and Engelmann (1912) reported several records of *R. clivosus* from the Cairo Region under *R. antinorii* Dobson, 1885, a name currently considered a junior synonym of *R. fumigatus* Rüppell, 1842 (both *fumigatus* Rüppell and *antinorii* Dobson were described from the Kingdom of Shoa [= central Ethiopia]; Rüppell 1842a, Dobson 1885). However, the specimens reported as *R. antinorii* by Anderson (1902) along with two male bats mentioned as *R. clivosus* by Doria (1887) represent the first undoubted records of *R. clivosus* from Egypt (see Qumsiyeh 1985).

Subsequently, two other names were used to designate the Egyptian populations of *R. clivosus* that are currently considered junior synonyms of this name, *R. acrotis* von Heuglin, 1861 and *R. andersoni* Thomas, 1904. The latter name was created by Thomas (1904: 156), based on a series of four immature specimens obtained from mountains of the eastern desert of Egypt (in fact, more or less exactly from the Egyptian-Sudanese border; type locality ‘eastern desert of Nubia, at ca. 600 m a. s. l., in or near Wadi Alagi, ca. 22°N, 35°E; Flower 1932). Andersen (1904, 1905a, c, 1906) suggested to assign *R. andersoni* to *R. acrotis*, either as a separate subspecies or as a synonym of the nominotypical form, described by von Heuglin (1861a: 10) based on a single male specimen from Kérén [= Keren, Eritrea; 15°47’N, 38°27’E].

Andersen (1905a) described another form of *R. clivosus* from Egypt, then named *R. acrotis brachygnathus*, based on the male specimen from the Second [?largest/tallest] Pyramid of Giza [= Pyramid of Chephren, 29°58’34”N, 31°07’51”E] collected and previously published by Anderson (1902). Andersen (1906: 179–180) summarised his view of the intraspecific taxonomy of the Egyptian populations now known as *R. clivosus* as follows: “*Rh. acrotis brachygnathus* differs from the typical form of the species in the following particulars: // The skull is distinctly slenderer; the nasal swellings narrower. The teeth are slightly smaller, and, in conformance with this,

the mandible shorter, the maxillary width [...] smaller. The horse-shoe and sella seem to average a little narrower. – Up to the moment of writing this I have not seen any example intermediate between *brachygnathus* and the typical *acrotis*. // *Rh. acrotis typicus* [= *R. acrotis acrotis*] is an inhabitant of Erythrea, *Rh. a. brachygnathus* of the Nile Valley, from Korosko to Cairo. // *Rh. acrotis andersoni* [...], from the Eastern Egyptian Desert [...], is probably indistinguishable from the typical form of *acrotis*, but I have as yet only seen immature examples [...]. // *Rh. clivosus* [of Somalia and eastern Ethiopia] differs from *Rh. acrotis* in the following particulars: // The skull is larger, especially broader [...], p^2 is present, situated external to the tooth-row; [...] in all the specimens I have seen of *Rh. acrotis*, including the immature individuals, p^2 is absent. Upper canine and p^4 in close contact, as in *acrotis*. // P_3 is absent in all the 5 specimens of *clivosus* to hand, the teeth of which show very different stages of wear (from practically unworn to much worn); but in one specimen some faint trace of the alveoli is observable under a lens. So far as p_3 is concerned there is, therefore, no noteworthy difference from *acrotis*, in which I always found this premolar tracelessly wanting, irrespective of the age of the individuals. // Externally these two bats are difficult to distinguish. The horseshoe and sella may average a little broader in *clivosus*.”

Although already Peters (1871b: 310) suggested to refer *clivosus* Cretzschmar and *acrotis* von Heuglin to a single species, the Andersen's (1904, 1905a, c, 1906) taxonomic view considering the separate species statuses of these two taxa remained in use for a long time, and numerous authors then referred the populations of (recently considered) *R. clivosus* of Egypt to *R. acrotis* (see Bonhote 1909, 1912, Flower 1932, Allen 1939, Ellerman & Morrison-Scott 1951, Setzer 1952, Wassif 1953, Theodor & Moscona 1954, Wassif & Hoogstraal 1954, Myers et al. 1962, von Lehmann 1964, El Sabban et al. 1967, Theodor 1967).

Ellerman et al. (1953) were perhaps the first who suggested the distribution range of *R. clivosus* being much larger than limited only to western Arabia and the Horn of Africa, sensu Andersen (1905c, 1906). The species was then reported to occur in an extensive range stretching from South Africa to Central Asia (Aellen 1959, Harrison 1964, Koopman 1966) and the populations formerly assigned to *R. acrotis* – including the Egyptian ones – were considered a part of *R. clivosus* (Sanborn & Hoogstraal 1955, Hoogstraal 1962, Hanák 1969, Kock 1969, Hayman & Hill 1971, DeBlase 1972a, Gaisler et al. 1972, Largen et al. 1974, Koopman 1975, 1993, Felten et al. 1977, Corbet 1978, Madkour 1978, Wassif et al. 1984, Qumsiyeh 1985, Wassif 1995, Csorba et al. 2003, Dietz 2005b, Dietz & Maltby 2006, Benda et al. 2008, 2014a, 2017, Dornburg et al. 2011, Benda & Vallo 2012, Stoffberg et al. 2012, etc.).

The taxonomic arrangement of the Egyptian populations of *R. clivosus* was then reported as composed of two subspecies, the small-sized *R. c. brachygnathus* occurring in the central and western parts of the country, including the whole Nile Valley, and the large-sized *R. c. clivosus* in Sinai and the mountains of south-eastern Egypt (Sanborn & Hoogstraal 1955, Hoogstraal 1962), the type series of *R. andersoni* was thus included in *R. c. clivosus*. On the other hand, Hayman & Hill (1971) mentioned three valid subspecies from Egypt, *R. c. clivosus* from Sinai, *R. c. andersoni* from the Eastern Desert, and *R. c. brachygnathus* from the Nile Valley. Due to the immature stage of the type series of *R. andersoni*, Koopman (1975) only tentatively synonymised this name with *R. c. clivosus* Cretzschmar; however, Qumsiyeh (1985) confirmed this opinion based on the results of a simple metric comparison. Several subsequent authors then mentioned two subspecies of *R. clivosus* from Egypt, the small-sized and pale brown coloured *R. c. brachygnathus* and the large-sized and very pale coloured *R. c. clivosus* (Harrison & Bates 1991, Koopman 1994, Horáček et al. 2000, Csorba et al. 2003). Corbet (1978) offered a rather extreme conception in this context and suggested all Egyptian populations to be regarded as a single, nominotypical subspecies. On the other hand, Burgin (2019a) reported only *R. c. brachygnathus* from the whole Egypt including Sinai.

A taxonomic revision of *R. clivosus* by Benda & Vallo (2012), combining molecular genetic and morphometric approaches, brought several additions to the taxonomic picture of *R. clivosus*. The type specimen of *R. andersoni* Thomas was shown to be a part of the populations of north-eastern African mountains, referred to *R. c. acrotis* von Heuglin, i.e., taxonomically arranged similarly to the view by Andersen's (1904, 1905a, c, 1906). However, the populations of the Ethiopian Highlands (*R. c. acrotis*) were shown to pertain to a lineage that is separated from *R. clivosus* s.str. of Egypt and Arabia, both in mitochondrial genes and in morphological characters (contra Corbet 1978 and/or Qumsiyeh 1985), and represents rather an independent species than a part of the latter species. On the other hand, the small-sized form *R. c. brachygnathus* of the Nile Valley of Egypt and the large-sized form *R. c. clivosus* from Sinai and western Arabia were shown to pertain to an identical genetic lineage, just as two geographically separated morphotypes of one taxon. Although the taxonomic re-arrangements that could result from these facts still need to be confirmed by coincident results of an analysis using nuclear markers, Lanza et al. (2015: 80) already adopted the separate species status of *R. acrotis*.

Anyway, detailed examinations of numerous Egyptian samples of horseshoe bats currently assigned to *R. clivosus* are needed to elucidate the status of particular populations. Their results could theoretically bring an evidence of presence of up to two additional species in the country, *R. acrotis* and *R. horaceki* (see Distribution). For the time being, two subspecies of *R. clivosus* are to be reported from Egypt, *R. c. clivosus* from most of the country (represented by two size-defined forms) and *R. c. acrotis* from the mountains of the south-eastern corner of Egypt.

***Rhinolophus hipposideros* (Borkhausen, 1797)**

RECORDS. Published data: J a n u b S i n a': Ain Sudr [1], oasis, 18 September 2005: det. & obs. min. 1 ind. (Benda et al. 2008); – Al Arbaein [2], August 1943: 1 m (Wassif et al. 1984); – Farsh el-Romana [3], garden Abu Hamat, 8 August 2005: obs. & rec. 1 ind., 15 August 2005: obs. & rec. 1 ind. (Dietz 2005b, Dietz & Maltby 2006); Farsh El Romana, Abu Hamat Garden, 8 August 2005: det., rec. & obs. 1 ind., 15 August 2005: det., rec. & obs. 1 ind. (Benda et al. 2008); – Wadi Feiran [4] near Feiran Oasis, hillside cave, May 1953: 1 m (Wassif & Hoogstraal 1954); Feiran Oasis (Sanborn & Hoogstraal 1955); Feiran Oasis, deep hillside cave (Hoogstraal 1962); Feiran Oasis, 21 May 1953: 1 ind., FMNH (Qumsiyeh 1985); Feiran Oasis, Wadi Feiran, garden el Braga, 12 August 2005: obs. & rec. 1 ind. (Dietz 2005b, Dietz & Maltby 2006); Feiran, El Braga Garden, 12 August 2005: det., rec. & obs. 1 ind. (Benda et al. 2008); – Wadi Klar [5], Abu Dagash, cave, 2 August 2006: net. 1 ms, 1 fa (Dietz & Maltby 2006, Benda et al. 2008); – Wadi Sheikh awad [6], Ecolodge Al-Karm, 17 August 2005: net. 1 ms, 1 fs (Dietz 2005b, Dietz & Maltby 2006); Wadi Sheikh awad, 17 & 18 August 2005: obs. & rec. 1 ind. (Dietz & Maltby 2006); Sheikh Awad, a small building attached to Sulliman garden, 12 July 2007: caught 1 fa, 1 mj (Truscott 2007); Sheikh Awad, El Karm Ecolodge, 17 August 2005: net. 1 ms, 1 fs, 18 August 2005: det., rec. & obs. 1 ind. (Benda et al. 2008); Sheikh Awad, Sulliman's Garden, 12 July 2007: found 1 fa, 1 mj (Benda et al. 2008); Wadi Shiekh Awad, 1 ind. (Dool et al. 2013).

IMPRECISE RECORD. Egypt, 1 ind. (DeBlase 1972a).

DISTRIBUTION. *Rhinolophus hipposideros* is a rare bat species in Egypt, it has been reported only from six or seven localities (Fig. 11; Table 2). The records are concentrated to the southern part of the Sinaitic Peninsula, mostly to mountain habitats in the altitude range of 443–1810 m a. s. l. (median 1140.0 m, mean 1202.6 m; Figs. 4, 5, Tables 3, 4; cf. Benda et al. 2008). Most of the findings have been made just recently (see Benda et al. 2008), only two records are older, coming from the 1940s and 1950s, respectively (Wassif & Hoogstraal 1954, Wassif et al. 1984). Only one of these old records of *R. hipposideros*, representing a single unsexed FMNH specimen, was available to Qumsiyeh (1985) for description of the Egyptian distribution of this bat. Also the record from Sinai originally attributed to *Rhinolophus* cf. *mehelyi* by Benda et al. (2008), could theoretically pertain to *R. hipposideros*, see below.

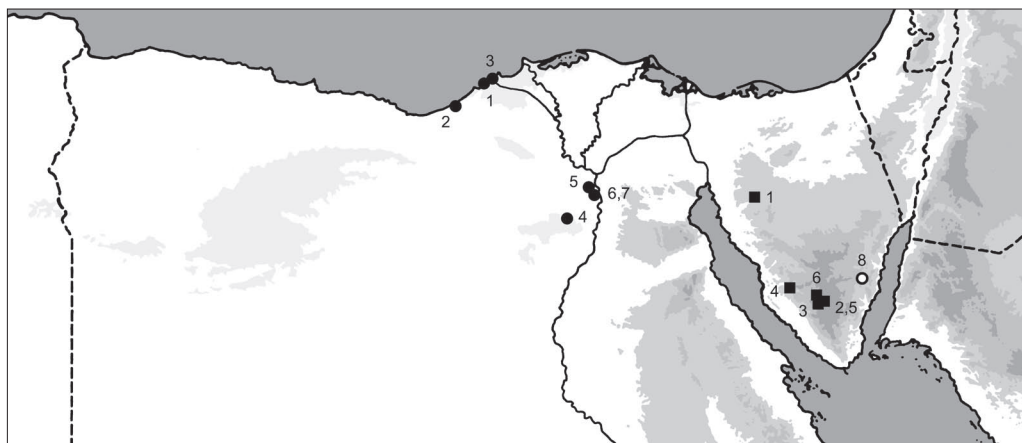


Fig. 11. Records of *Rhinolophus hipposideros* (Borkhausen, 1797) (squares) and *R. mehelyi* Matschie, 1901 (circles) in Egypt; for explanations see Fig. 3. Open symbol denotes a record of uncertain species identification (*R. hipposideros* or *R. mehelyi*; for details see text).

The occurrence of *R. hipposideros* in Sinai represents an extreme range projection from the Levant and is the westernmost point of the distribution range of this bat south of the Levant (Gaisler 2013a). In the neighbouring Levantine countries this bat occurs abundantly in the Mediterranean habitats situated north of the Dead Sea (Harrison & Bates 1991, Benda et al. 2010), although several records are also known from the central Negev Desert and the northern part of the Arava/Araba Valley (for a review see Mendelssohn & Yom-Tov 1999, Benda et al. 2008, 2010).

The general distribution range of *R. hipposideros* covers mainly the Mediterranean arboreal zone of the Mediterranean Basin, with extensions to the temperate zones of Europe and Central Asia; in the south, it reaches the Afro-tropical Region via the Rift Valley from the Levant, over western Saudi Arabia to the Sudan, Eritrea, Djibouti, and Ethiopia. However, the Egyptian occurrence spot is completely isolated from the African distribution in the south and west, since these range parts are separated by gaps of some 1,500 km (East Africa) and 2,200 km (Maghreb), respectively (see Gaisler 2013a).

TAXONOMY. The Sinaitic populations of *Rhinolophus hipposideros* were just after their discovery assigned to *R. h. minimus* von Heuglin, 1861 (Wassif & Hoogstraal 1954). This opinion was accepted by numerous subsequent authors (Sanborn & Hoogstraal 1955, Hoogstraal 1962, Harrison 1964, Hayman & Hill 1971, Gaisler et al. 1972, Qumsiyeh 1995, Harrison & Bates 1991). The taxon was described as a separate species from 'Kérén in den Bogosländern' [= Keren, Eritrea; 15°47'N, 38°27'E] by von Heuglin (1861a: 4, 6), but shortly after the description, it was placed into the synonymy of *R. hipposideros* by Peters (1871b) and this taxonomic view was soon adopted by subsequent authors (Dobson 1876a, 1878, Trouessart 1879, 1897, Andersen 1904).

Andersen (1905b) revised the intraspecific taxonomic arrangement of *R. hipposideros*, and recognised the subspecies *R. h. minimus* in the populations of the whole Mediterranean Basin, including southern Europe, the Levant, and northern and eastern Africa. Under this conception, this subspecies was characterised by a small size of body and skull, narrow nasal swellings and very narrow infraorbital bridges of the skull, and a cuneate sella and narrow horseshoe of the noseleaf (Andersen 1905b, 1918). These characters were reported to differentiate this subspecies from the

temperate European form *R. h. hipposideros*, and the form *R. h. midas* Andersen, 1905, occurring in the eastern part of the Middle East and eastwards. This taxonomic view was generally mostly accepted and remains the same until recently (see Miller 1912, Allen 1939, Ellerman & Morisson-Scott 1951, Felten et al. 1977, Harrison & Bates 1991, Koopman 1994, Qumsiyeh 1996, Roer & Schober 2001, Csorba et al. 2003, Simmons 2005, Gaisler 2013a, Lanza et al. 2015, Burgin 2019a), sometimes with modifications concerning certain populations of the range margins and/or Mediterranean islands (see e.g., Csorba et al. 2003 and/or Benda et al. 2006 for a review).

However, these geographical delimitations of taxa do not correspond well with the results of phylogenetic analyses based on molecular genetic approaches to evaluate the variation in *R. hipposideros* (Kûs 2008, Dool et al. 2013, Shahabi et al. 2019). All such analyses agree in the basic division of the species to the western (European and Maghrebian) lineage, and the eastern (Asian) lineage (see also the review by Benda & Gaisler 2015). Unfortunately, none of these analyses included the samples from the Ethiopian Highlands, the region of origin of the type material of *R. h. minimus* (see above). The phenotypic plasticity of the species that originally led to definition of numerous subspecies within the rank of *R. hipposideros* (Andersen 1905b, 1918, Ellerman & Morisson-Scott 1951, Koopman 1994), found minimum reflection in this phylogenetic picture.

Anyway, since Dool et al. (2013) included a sample from Sinai into their analysis, the Egyptian populations of *R. hipposideros* were proved to be a part of the eastern lineage. This result is well understandable from the biogeographical perspective; besides Sinai, the eastern lineage comprises the populations of the Levant, Cyprus, southern Anatolia, Iran, and Tajikistan. Considering the phylogenetic structure of the species and the mutual genetic distances among populations (Dool et al. 2013, Shahabi et al. 2019), the two basic lineages could be regarded as two subspecies of *R. hipposideros*. Since the distribution of the Euro-Maghrebian lineage covers also Germany, the type locality of *R. hipposideros* (see Borkhausen 1797: 85), this lineage naturally represents the nominotypical subspecies. The eastern lineage could be co-identified with *R. h. midas*, a form described from 'Jask, Persian Gulf' [= Bandar-e Jask, Iran; 25°39'N, 57°47'E] (Andersen 1905b: 140), and a name traditionally used for designation of the Middle Eastern populations of *R. hipposideros* (see above). However, there still remains a possibility of using the name *R. h. minimus* for the eastern lineage, when a genetic analysis indicates an adequate phylogenetic proximity of the Asian and Ethiopian populations of this species.

Rhinolophus mehelyi Matschie, 1901

RECORDS. Published data: El Eskenderiyah: Alexandria [1], 1 ind., ZMUC (Qumsiyeh 1985); – Bourg El-Arab [2], fifty kilometres west of Alexandria, south of the ancient temple of Oziris, old well, May 1951: coll. inds. (Wassif 1953 [as *R. euryale*]); Western Desert (Burg El Arab) (Sanborn & Hoogstraal 1955); Roman ruins near Burg el Arab (Hoogstraal 1962); Burg el Arab, near Mariut, inds., FMNH (DeBlase 1972b); Burg El Arab, 5 inds., FMNH, USNM (Qumsiyeh 1985); – Ramleh near Alexandria [3], 2 m, 2 f (Anderson 1902 [as *R. euryale*]); Ramleh, 2 inds., BMNH (DeBlase 1972b); Ramleh, 1 ind., BMNH (Qumsiyeh 1985). – El Fayum: Kom O-Shim [4], inds. (Heyneman & Macy 1962). – El Jizah: Giza [5], without definite locality, 21 April 1904: 1 ind. (Flower 1932 [as *R. euryale*]); Giza (Sanborn & Hoogstraal 1955); Giza Pyramid, September (Hoogstraal & Traub 1963); Giza, near the Great Pyramid, 5 inds., FMNH (DeBlase 1972a); Giza Pyramid, inds., FMNH (DeBlase 1972b); Giza Pyramids, 230 inds., BMNH, FMNH, USNM (Qumsiyeh 1985); Giza Pyramids, 20 September 1951: 1 ind. (Coetzee & Segermann 1992); – Sakkarah [6], 1 ind., BMNH (DeBlase 1972b); Saqqara, 3 inds., BMNH, CMNH (Qumsiyeh 1985); – Serapeum near Sakkarah [7], 1 m (Anderson 1902 [as *R. euryale*]); Serapeum, 1 ind., BMNH (Qumsiyeh 1985). – J anub S in a': Ain Hudra [8], oasis, 13 September 2005: det. & rec. 1 ind. (Benda et al. 2008 [as *R. cf. mehelyi*]).

IMPRECISE RECORDS. Ägypten (Fitzinger & von Heuglin 1866, Fitzinger 1870a [as *R. Euryale*]); Egypt (von Heuglin 1877 [as *R. Euryale*]); Egypt (Hoogstraal 1955, 1956, Myers et al. 1962); Egypt, 8 inds., BMNH, FMNH (DeBlase 1980). – Lower Egypt (Allen 1939 [as *R. euryale*]). – vicinity of Cairo and Giza Province [5–7], October 1959 – October 1961: 2 inds. (Mohammed & Saoud 1965 [as *R. euryale*]).

DISTRIBUTION. *Rhinolophus mehelyi* ranks among rare bat species in Egypt, it has been found only in seven or eight localities (Fig. 10; Table 2). It was reported from four geographic regions of Egypt, from monuments of Giza and surroundings in the Cairo Region, from the Mediterranean Sea shore in the vicinity of Alexandria, from the Faiyum Oasis adjacent to the Nile Valley, and from eastern Sinai; in all these areas *R. mehelyi* is an infrequent faunal element. All the Egyptian findings from the African continent were made before 1985, the only exception is the record from the oasis of Ain Hudra, Sinai, made in 2005 (Benda et al. 2008). However, the latter record was presented only as of *R. cf. mehelyi*, i.e., with some uncertainty.

The Egyptian records of *R. mehelyi* from the African continent are available from an extremely narrow range of lowland altitudes of 1–69 m a. s. l. (median 30.0 m, mean 29.1 m; Fig. 4, Table 3). The uncertain Sinaitic record comes from a medium-high altitude of 680 m a. s. l. Considering the continental African occurrence of *R. mehelyi*, this species is the most lowland bat of Egypt (along with *Tapophous nudiventris* and *Pipistrellus kuhlii*, see Fig. 4).

The Sinaitic record was reported as uncertain since it was based on a recording of a single sequence comprising twelve echolocation calls. The peak frequencies of these calls were within the range of 105.4–105.9 kHz (mean 105.7 kHz; Benda et al. 2008); these values conform to the call parameters of *R. mehelyi* from Europe and/or other parts of the Middle East (Heller & von Helvesen 1989, Russo et al. 2001, Salsamendi et al. 2005, Siemers et al. 2005, Shahabi et al. 2019, etc.). On the other hand, these values are very close to the call parameters of *Rhinolophus hipposideros* recorded in Sinai (106.7–108.0 kHz; mean 107.4 kHz, n=6; Benda et al. 2008) or in the Levant (104–110 kHz; Mendelssohn & Yom-Tov 1999, Benda et al. 2010). Moreover, Shahabi et al. (2019) documented a broad overlap in parameters of echolocation calls of *R. mehelyi*, *R. hipposideros*, and *R. euryale* in southern Iran, making the proper identification of species impossible solely on the basis of call frequency analysis. All these data suggest that the determination of *R. mehelyi* from its echolocation call cannot be unambiguous in the areas of the southern Middle East where the occurrence of *R. hipposideros* and *R. euryale* is likely. Since *R. hipposideros* was demonstrated to be a rather frequent bat species in Sinai (see above and Table 2), the record affiliated to *R. mehelyi* by Benda et al. (2008) is really challenged. Moreover, the locality is situated in a desert region which does not seem quite typical of the species. As already Benda et al. (2008) concluded, only a larger amount of good quality field recordings of the echolocation calls from Sinai and adjacent territories could help resolve the problem of identification of the three respective bat species. However, the presence of each of these species could be proven only when an individual is documented directly and unchangeably.

Azim (1936) reported a finding of *Rhinolophus euryale* from the Dakhla Oasis in the Western Desert of Egypt. This report was accepted as a record of *R. mehelyi* by Heyneman & Macy (1962), similarly as other old reports of *R. euryale* from Egypt were interpreted (see below). However, the occurrence of *R. mehelyi* in the desert habitats of an oasis deep inside the Sahara is quite improbable. We here consider this record as a misidentified finding of *Asellia tridens*, the only rhinolophoid bat species known from the southern oases of the Western Desert of Egypt, including Dakhla (Wassif 1959a, b, Wassif et al. 1984, Benda et al. 2014a, Mohallal & Ahmed 2018; Fig. 12).

The current picture of distribution of *R. mehelyi* in Egypt fully conforms to the view given by Qumsiyeh (1985), since the number of records has not changed (with an exception of the ambiguous Sinaitic record). The distribution range of this bat covers a relatively narrow belt of the Mediterranean habitats in the Mediterranean Basin and the western part of the Middle East. The Egyptian occurrence area of *R. mehelyi* (excluding Sinai) is isolated from the remaining segments of the distribution range of this bat, similarly as other islands of its occurrence in Africa, in arboreal habitats of Cyrenaica and the Maghreb (Gaisler 2013b). The record from Saqqara, El Jizah Governorate (DeBlase 1972b), represents the southernmost evidence of this species in Africa [29°51'N].

The possible record from Ain Hudra is situated even more southward [28° 54' N] (Benda et al. 2008); however, in Asia *R. mehelyi* reaches even more to the south, with the southernmost known point in the Tadovan Cave, south-western Iran [28°51'N] (Shahabi et al. 2017).

TAXONOMY. The Egyptian populations of *Rhinolophus mehelyi* were originally referred to *R. euryale* Blasius, 1853, a sibling species of *R. mehelyi* with a very similar circum-Mediterranean type of distribution (Fitzinger & von Heuglin 1866, Fitzinger 1870a, von Heuglin 1877, Anderson 1902, Flower 1932, Allen 1939, Ellerman & Morrison-Scott 1951, Setzer 1952, Wassif 1953, Mohammed & Saoud 1965). On the other hand, Hoogstraal (1955) and Sanborn & Hoogstraal (1955) suggested to regard the Egyptian medium-sized horseshoe bats as *R. mehelyi*, and the latter authors supported this opinion by dimension data taken from the Egyptian bats, viz. forearm length 47.2–52.1 mm, condylocanine length of skull 19.0–20.3 mm, and length of upper tooth-row 6.6–7.1 mm, i.e., in ranges fitting *R. mehelyi* from other parts of its range (see e.g., Gaisler et al. 1972). Additionally, Sanborn & Hoogstraal (1955: 114) concluded as follows: “*Rhinolophus euryale* probably does not occur in Egypt” and Hoogstraal (1962: 156) as follows: “*R. mehelyi* ranges [...] into northern Egypt. *R. euryale judaicus*, reported in literature from Egypt, apparently is an error.” Despite the clear support by metric data, several authors still doubted these identifications and/or conclusions and referred again these populations to *R. euryale* (Harrison 1964, Hayman & Hill 1971, Atallah 1977). However, the correct determination of these bats was confirmed by DeBlase (1972b) and Qumsiyeh (1985), who revised all specimens available in the BMNH, CMNH, FMNH, USNM, and ZMUC collections (corresponding with all records of *R. euryale* mentioned by Anderson 1902, Flower 1932, and Wassif 1953) and identified only *R. mehelyi* among them. The exclusive presence of *R. mehelyi* in Egypt out of the sibling pair has been then mostly adopted (Qumsiyeh 1985, Koopman 1994, Csorba et al. 2003, Benda et al. 2006, 2014b), although some authors describing the distribution range of *R. euryale* use the expression “perhaps Egypt” (Harrison & Bates 1991, Koopman 1993, Horáček et al. 2000, Simmons 2005). However, no evidence exists for the suggestion mentioned by the latter authors and already Qumsiyeh (1985: 76) included *R. euryale* among the species names deleted from the faunal list of Egyptian bats.

Under the (abandoned) conception referring the Egyptian populations to *R. euryale*, these populations were affiliated to the subspecies *R. e. judaicus* Andersen et Matschie, 1904 (Andersen 1905b, c, Allen 1939, Ellerman & Morrison-Scott 1951, Atallah 1977). This taxon was described as a full species, *Rhinolophus (Euryalus) judaicus*, based on a material collected in and near Jerusalem, Palestine*, along with five other new species and three already described species within this subgenus, including *R. euryale* and *R. mehelyi*, the latter described just three years before (Matschie 1901). These nine species were distinguished from each other based on rather minute differences in external characters, namely in ear size and shape, noseleaf shape, extent of wing membrane on tibia, phalanx ratio of the fourth wing finger, body size, and colouration (Andersen & Matschie 1904). Regarding the scope of these characters, Andersen (1905c) considered all these nine nominate forms to be subspecies of *R. euryale*. Two of their names, *mehelyi* Matschie, 1901 and *carpetanus* Cabrera, 1904, were separated by Miller (1912) from the species rank of *R. euryale* to the rank of *R. mehelyi*. However, since Miller (1912) concerned only the European fauna, he did not revise the position of *judaicus*. Therefore, for a long time, the name *R. judai-*

* NOTE. Andersen & Matschie (1904: 81) indicated the ‘Höhle Adullam bei Jerusalem’ to be the type locality of *Rhinolophus (Euryalus) judaicus* Andersen et Matschie, 1904. Atallah (1977: 294) co-identified this site with “Mogharet Khureitun, [...] [a] cave located about 4 km southeast of Beit Sahur (31°40'N and 35°15'E) and about 10 km southeast of Jerusalem” [upper part of Wadi Khureitun, West Bank, Palestine]. However, the ‘Höhle Adullam’ most probably represents the artificial underground space known as the Adullam Caves at Tel Adullam, ca. 25 km south-west of Jerusalem, Israel [31°39'03"N, 35°00'08"E].

cus remained in the synonymy of *R. euryale*, and frequently also as the name of its Levantine subspecies (von Wettstein 1913, Flower 1932, Bodenheimer 1935, 1958, Allen 1939, Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Harrison 1956, 1964, Hoogstraal 1962, Lewis & Harrison 1962, Niazi 1976, Atallah 1977, Felten et al. 1977, Corbet 1978, Harrison & Bates 1991, Koopman 1993, 1994, Qumsiyeh 1996, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000, Csorba et al. 2003, Simmons 2005).

Benda et al. (2006) evaluated the type material of *R. (E.) judaicus* (holotype and two other specimens mentioned by Andersen & Matschie 1904) in respect to its relationship to *R. euryale* or *R. mehelyi*, and determined the specimens as *R. mehelyi*; later this identification was confirmed by Turni & Kock (2008). Based on an evaluation of metric data (original and published) on *R. mehelyi* from the most of its distribution range, Benda et al. (2006) consequently suggested the populations of Cyrenaica, Egypt, and the Levant to be assigned to *R. mehelyi judaicus*, while the remaining populations of the species from Europe and the Maghreb to its nominotypical form. The main difference between the subspecies is their body size, the populations of *R. mehelyi* in the west and north of the distribution range are represented by large-sized bats, while those of the south-eastern part of the range, including Egypt, are small-sized bats. This observation is in agreement with the findings by Qumsiyeh & Schlitter (1982) and Qumsiyeh (1985), who reported the Cyrenaican and Egyptian individuals of *R. mehelyi* to be the smallest in body size among all samples of the species; moreover, this difference from other populations could explain why various authors have identified the Egyptian material as *R. euryale* (Qumsiyeh & Schlitter 1982: 384), since *R. euryale* is smaller than *R. mehelyi* (see e.g., Miller 1912, DeBlase 1972b). The affiliation of the Egyptian populations to the same taxon as of the Levant (although under a different species conception) is in line with the opinions of many previous authors (Andersen 1905b, c, Flower 1932, Allen 1939, Ellerman & Morrison-Scott 1951, Harrison 1964, Atallah 1977). Andersen (1905b: 137) concluded as follows “specimens from Lower Egypt are indistinguishable from the Palestine form, *Rh. e. judaicus*”; after a switch of the species name, this statement seems to be still valid (see also Benda et al. 2014b, Burgin 2019a).

On the other hand, some authors considered *R. mehelyi* as a monotypic species in its circum-Mediterranean range (Corbet 1978, Qumsiyeh 1985, Harrison & Bates 1991, Horáček et al. 2000).

Asellia tridens (Geoffroy, 1813)

RECORDS. Published data: A s y u t: El Maabdeh Cave [1], 1 ind., USNM (Setzer 1952); El Maabdeh Cave, 1 ind., USNM (Qumsiyeh 1985). – A s w a n: Abou Simbel [2], January–March 1904: 2 m, 1 f (Schwann 1905); Abu Simbel Temple, end of May 1900: coll. many inds., BMNH (Flower 1932); Abu Simbel, 1904: coll. inds. (Flower 1932); Abu Simbel, 60 km NNE Wadi Halfa, 31 December 1904: 2 ma, 1 fa, NMW (Bauer 1963); Abu Simbel, 1897: 14 inds., ZFMK (von Lehmann 1964); Abu Simbel, 37 inds., BMNH (Qumsiyeh 1985); Abu Simbel, 27 January 1904: 2 f, MSNG (Benda et al. 2011b, 2014b); – Assuan [3], 1 ind., BMNH (Dobson 1878); Assuan (Trouessart 1897); Assuan, Tombs in the west banks, greater numbers, coll. 5 m, 5 f (Anderson 1902); am Wege von Assuan nach Shellal [= Aswan], 7 February 1914: 2 m, 1 f, NMW (von Wettstein 1918); Assuan, 3 m, 1 f, MSNG (de Beaux 1931); Aswan (Sanborn & Hoogstraal 1955); Aswan, 6 inds., BMNH (Qumsiyeh 1985); Aswan, tunnel under railway, 24 January 2010: net. 8 m, 2 f, NMP, 10 January 2011: net. 2 m (Benda et al. 2011b, 2014a, b, cf. Bray & Benda 2016); Garbu Suan, February 1907: 4 m, 2 f, MSNG (Benda et al. 2011b, 2014b); Aswan, Tombs of Nobles, 9 January 2011: obs. a colony of ca. 130 inds. (Benda et al. 2014a); Aswan, 10 inds., NMP (Karmáčková 2017); – Edfu [4], 19 inds., SMF (Kock 1969); – Elkab necropolis [5], upper mastaba tomb, 1996: remains of 5 inds. (Gautier 2005); – Gebel Adda [6], 9 February 1964: 1 ind., YPM (Dornburg et al. 2011); – Korosko [7], 2 f, MSNG (de Beaux 1931); – Nag Misaw [8], Abu Simbel East, 17 & February 1964: 3 inds., YPM (Dornburg et al. 2011). – B a n i S u e f: Bani-Swaif [9], 1972–1975 (Saoud & Ramadan 1977a, d); – El Riyad [10], 3 September 1987: coll. 1 ind. from *Asio otus* pellets (Handwerk 1990); – Henneh [11], 1 ind. (Setzer 1952). – E l B a h r E l A h m a r: Southeastern Desert (Bir Abra) [12] (Sanborn & Hoogstraal 1955); Bir Abra (Jobling 1956); Bir Abra (Hoogstraal et al. 1957a, b); Bir Abra (Hoogstraal 1962); Bir Abra, 8 inds., FMNH, USNM (Qumsiyeh 1985); Bir Abra, 2 f, FMNH, USNM (Owen & Qumsiyeh 1987); – eastern desert of Egypt [13], near the Soudan frontier, about lat.

22° and long. 35°, BMNH (Thomas 1904); eastern desert of Nubia, in or near the Wadi Alagi, about 22° N. by about 35° E., summer 1903, BMNH (Flower 1932); Wadi Alagi, 1 ind. BMNH (Koopman 1975); Wadi Alagi, 1 ind., BMNH (Qumsiyeh 1985); – Koseir [14], coll. 1 ind. (Klunzinger 1878). – E l F a y u m: Faiyum [15] (Sanborn & Hoogstraal 1955); Kom-O-Shim, May (Hoogstraal & Traub 1963); Kom Oshim, 31 inds., FMNH, USNM (Qumsiyeh 1985). – E l J i z a h: Abu-Rawash [16], 1972–1975 (Saoud & Ramadan 1976a, 1977a); Abu Rawash, May 1966: 4 ma, 4 ms, 16 fa, 15 fs, June 1966: 8 f, June 1967: 1 m, 1 f, ASUC (Wassif et al. 1984); Abu-Rawash, coll. 120 ma, 120 fa (Selim 2002); – Abu Sir [17], tombs and caves, 5 January 1953: inds. (Macy et al. 1961); Abu Sir, 10 inds., FMNH (Qumsiyeh 1985); Abusir, tombs of Abusir South, coll. remains of 1 ind. (Pokorný et al. 2009); – Bahariya Oasis, Bawiti [18], palm orchard, 16 October 2011: det. & obs. tens of foraging inds. (Benda et al. 2014a); Bawiti, old tomb, 16 October 2011: obs. 2 roosting inds. (Benda et al. 2014a); – Bahariya Oasis, Bawiti [19], a volcanic mountain at the NW edge of the oasis, 17 October 2011: det. & obs. tens of foraging inds. (Benda et al. 2014a); – Bahariya [Oasis], Bir Abu Darag [20], Mandisha, January–February 1958: coll. 5 m (Wassif 1959a, b); Bahariya Oasis, February 1958: 6 m, 1 f, ASUC (Wassif et al. 1984); Bahariya (Hoogstraal 1962); Bahariya Oasis, Mandishah, small tomb, 20 November 2010: obs. 1 roosting ind., remnants of a colony (Benda et al. 2014a); – Bakkari [21], 54 inds., USNM (Qumsiyeh 1985); – Dahshour [22], June 1966: 19 f, July 1966: 6 m, 45 fa, 2 fs, ASUC (Wassif et al. 1984); – El Badrshin [23], 21 inds., FMNH (Qumsiyeh 1985); – Embaba [24], 1 m, ASUC (Wassif et al. 1984); – Giza [25] (Sanborn & Hoogstraal 1955); Giza, August 1968: 8 m, 1 f, ASUC (Wassif et al. 1984); Giza Governorate, coll. inds. (Ramadan 1986); Giza province, 1987: 58 inds. (Kaaoud et al. 1989); – Lisht [26], Upper Egypt, 5 f, 27 inds., USNM (Setzer 1952); El Lisht, 64 inds., FMNH, USNM (Qumsiyeh 1985); – Jaggarah [= Saqqarah] [27], 1 m, NHMB (Engelmann 1912); Sakkarah, 4 m, MSNG (de Beaux 1931); Saqqara (Setzer 1952); Sakkara (Wassif & Hoogstraal 1954); Sakhara, 4 May 1821 (Stresemann 1954); 20 km südl. Kairo, 1 ind., SMF (Kock 1969); Sakkara, January 1956: 1 m, 2 f, ASUC (Wassif et al. 1984); Saqqara, 19 inds., SMNS, USNM (Qumsiyeh 1985); Saqqara, 1 f, SMNS (Owen & Qumsiyeh 1987); Sakkarah, 1 m, 2 f, MNCN (Ibáñez & Fernández 1989); Sakkarah, May 1906: 4 m, MSNG (Benda et al. 2011b, 2014b). – E l M i n i y a: Minia [28], 1 m (Anderson 1902); – Tuna el-Gebel [29], necropolis, hundreds inds. (Boessneck & von den Driesch 1987). – E l Q a h i r a h: [Cairo], Abbasia [30], May 1966: 3 m, 19 f, June 1966: 2 m, 8 f, June 1967: 2 f, ASUC (Wassif et al. 1984); – El Cairo [31], 3 inds., MNCN (Cabrera 1912); La Caire (Gohar 1934); Cairo Area (Hoogstraal 1952); Cairo, 1 ind. (Sanborn & Hoogstraal 1955); Cairo (Hoogstraal et al. 1957b); near Cairo, 12 inds. (Pye 1972); Cairo, El Barkoki Mosque, July, August and September: coll. hundreds inds. (Madkour 1977b); Cairo, Soltan Barkouky Mosque, 1972–1975 (Saoud & Ramadan 1977a, d); Cairo, Barkoki Mosque (Madkour 1978); Mokattam, June 1966: 6 m, 25 f, July 1966: 9 m, 22 f, August 1966: 6 m, 27 f, September 1966: 6 m, 26 f, June 1967: 4 m, 12 f, ASUC (Wassif et al. 1984); Cairo, 22 inds., FMNH, MQC, USNM (Qumsiyeh 1985); Old City of Cairo, coll. inds. (Ramadan 1986). – E l Q a l y u b i y a h: 10 km nördl. Kairo [32], 6 inds., SMF (Kock 1969). – E l U q s u r: Gebelein [33], cave, 24 April 1918: 1 ind. (Flower 1932); – Aegypten, Gewölben der Königsgräber [= Thebes] [34] (Oken 1816); tombeaux des rois [= Thebes] (Geoffroy 1818, 1828, Temminck 1835); Egypte, dans les cavernes et les tombeaux [= Thebes] (Desmarest 1820); Karnak, Medinet-Hâbû, Qurneh, in Tempeln (Hartmann 1868); Thebes, 1 ma, 1 ind., BMNH (Dobson 1878); Thebes, tomb, February 1874: 1 m (Flower 1884, cf. Doran 1878); Thèbes, 3 inds. (La-taste 1885); Tomb of Seti the First, 1 m (Anderson 1902); Thebes, Tombs of Assasif, 1892: vast numbers, coll. 1 m, 1 f (Anderson 1902); Luxor und Theben, Tempelruinen, 87 inds. (Sassi 1908); Theben, 1 m, NHMB (Revilliod 1913); Karnak, Chunsu-Tempel, 6 February 1914: 1 m, NMW (von Wettstein 1918); Luxor (Thebes), Deir-el-Medina, tomb, 30 April 1969: 18 ma, 4 ms, IVB (Gaisler et al. 1972); Karnak, Big Temple, 1 May 1969: 2 f, IVB (Gaisler et al. 1972); near Luxor, series of inds., FMNH (Koopman 1975); Luxor, 1972–1975 (Saoud & Ramadan 1976a, 1977b, d); Luxor, February 1949: 1 m, 4 f, ASUC (Wassif et al. 1984); Luxor, 41 inds., BMNH, MQC, NHMB (Qumsiyeh 1985); near Luxor, 33 inds., BMNH, FMNH (Qumsiyeh 1985); Luxor, coll. inds. (Ramadan 1986); Luxor, 11 m, 3 f, CMNH (Owen & Qumsiyeh 1987); Thebes, 1 m, MNHN (Benda et al. 2006, 2011b, 2014b); Thebes, tombs, 30 April 1969: 17 m, 2 inds., IVB (Benda et al. 2006, 2011b, 2014b); Dra Abu el-Naga, 2016–2019: coll. several inds. (Woodman & Ikram 2020). – E l W a d i E l J a d i d: Dakhla Oasis, Budkhula [35], abandoned house, 21 August 2011: obs. a colony of ca. 1300 inds., 4 July 2012: obs. a colony of ca. 300 inds., exam. 4 fa, 1 fj (Benda et al. 2014a); – Dakhla Oasis, Deir El Hagar [36], Mauhoub, vertical tomb, 27 November 2010: obs. a colony of ca. 120 inds., 30 March 2011: obs. a colony of ca. 70 inds. (Benda et al. 2014a); – Dakhla Oasis, El Qasr [37], medina, abandoned house, 22 August 2011: obs. a colony of ca. 3000 inds., 13 October 2011: obs. a colony of ca. 3500 inds., exam. 10 fa, 2 mj, 8 fj, 3 July 2012: obs. a colony of ca. 2000 inds. (Benda et al. 2014a); El Qasr, palm orchard, 31 March 2011: net. 1 fs, NMP (Benda et al. 2014a); Dakhla oasis, 2014–2018: obs. inds. in roosts (Mohallal & Ahmed 2018); – Dakhla Oasis, Mût [38], main graveyard and roofed lanes between houses, January–February 1959: coll. inds. (Wassif 1959b); Dakhla (Hoogstraal 1962); – Dakhla Oasis, Qalamoun [39], abandoned house in a palm orchard, 20 August 2011: obs. a colony of ca. 20 inds., 10 October 2011: obs. a colony of 58 inds., exam. 4 m, 16 f (Benda et al. 2014a); – Dakhla Oasis, Rashda [40] (Azim 1936 [as *Rhinolophus euryale*]); Dakhla Oasis, Er Rashda, abandoned building, 23 November 2010: obs. a colony of ca. 70 inds., exam. 6 fa, 27 March 2011: obs. 2 inds., 6 April 2011: obs. 1 ind., 20 August 2011: obs. a colony of ca. 1000 inds., exam. 5 ma, 4 ms, 10 mj, 13 fa, 5 fs, 11 fj, 10 October 2011: obs. a colony of ca. 1500 inds., exam. 2 ma, 1 mj, 8 fa, 5 fj, NMP, 13 October 2011: net. 1 fj, 28 February 2012: 1 ind., 4 July 2012: obs. a colony of ca. 3000 inds. (Benda et al. 2014a, b); – Farafra

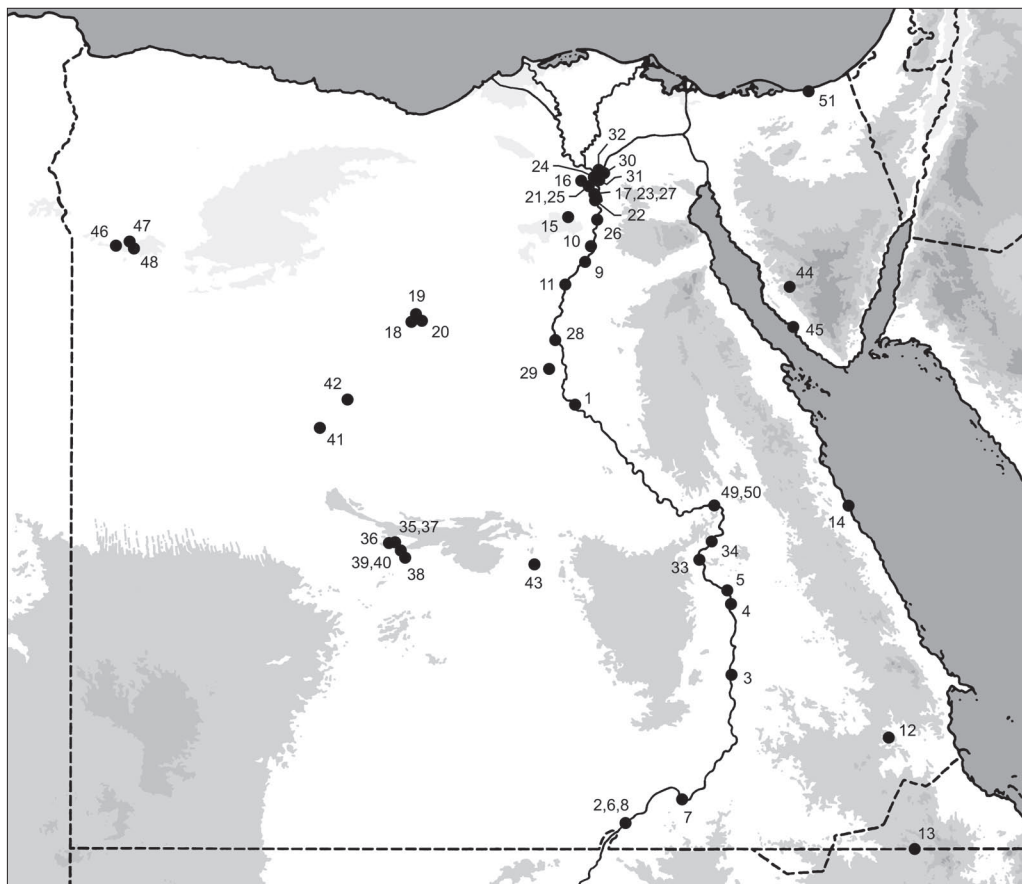


Fig. 12. Records of *Asellia tridens* (Geoffroy, 1813) in Egypt; for explanations see Fig. 3.

[Oasis], Ain el Raml [41], Qasr Farafra, 29–31 January 1958: coll. 8 m, 3 f (Wassif 1959a, b); Farafra (Hoogstraal 1962); Farafra Oasis, January 1958: 5 m, 3 f, ASUC (Wassif et al. 1984); Farafra, Ain El Raml, well (Wassif 1995); – Farafra Oasis, small cave ca. 45 km NE of the Farafra oasis [42], 20 November 2010: obs. a colony of ca. 30 inds., exam. 1 ma, 2 fa (Benda et al. 2014a); – Oasis of Kharga [43], one of the tombs of the ancient Christian city of Necropolis, January 1942: coll. 12 m, 15 f (Wassif 1949); Oasis of Kharga, 12 inds., USNM (Setzer 1952); Kharga city, burial chambers of the ancient Necropolis, January–February 1959: coll. inds. (Wassif 1959b); Kharga (Hoogstraal 1962); Kharga Oasis, City of Deads, tomb, 6 May 1969: obs. a colony of at least 500 inds., coll. 1 m, 3 f, IVB (Gaisler et al. 1972); Kharga Oasis, Temple of Ibis, 6 May 1969: obs. a colony of some 50 inds., 2 m, 8 f, IVB (Gaisler et al. 1972); Al-Kharga, 1972–1975 (Saoud & Ramadan 1977a, b, d); El Kharga Oasis (Madkour 1978); Karga Oasis, January 1942: 2 m, 1 f, 7 inds., ASUC (Wassif et al. 1984); El Kharga Oasis, 12 inds., USNM (Qumsiyeh 1985); Al Kharga Oasis, coll. inds. (Ramadan 1986); Kharga Oasis, 2.5 km north of Kharga City, a crevice in a lone rock outcrop, 5 February 1989: coll. 10 inds. from *Bubo ascalaphus* pellets (Goodman 1990); Kharga Oasis, a chamber of the Hibis Temple, obs. (Goodman 1990); Khargah Oase, 18 October 1980: 1 ma, ZFMK (Benda et al. 2014a); Kharga oasis, 2014–2018: obs. inds. in roosts (Mohallal & Ahmed 2018). – J a n u a r y: Feiran Oasis [44], Wadi Feiran, garden el Braga, 11 August 2005: obs. & rec. 1 ind. (Dietz 2005b, Dietz & Maltby 2006); Feiran, El Braga Garden, 11 August 2005: obs., det. & rec. 1 ind. (Benda et al. 2008); – Tor [45], Sinaitic Peninsula, 1 f (Anderson 1902); Tor, October–November 1823 (Stresemann 1954); El Tur, Hammam Musa, above a pool, 10 September 2005: det. & rec. 1 ind. (Benda et al. 2008). – M a t r u h: Siwa [46],

1935: coll. 16 m, 1 f (Hayman 1949); Western Desert (Siwa Oasis) (Sanborn & Hoogstraal 1955); Siwa (Hoogstraal 1962); Siwa Oasis, 18 inds., BMNH, USNM (Qumsiyeh 1985); Siwa, 1 f, FMNH (Owen & Qumsiyeh 1987); Siwa oasis, Shali, 12 April 2002: 1 ma, 3 fs, NMP (Benda et al. 2006, 2008, 2011b, 2014b); Siwa Oasis, tomb on the northern outskirts of the Siwa Oasis, 7 March 2012: obs. remnants of a colony, coll. 1 ind. (Benda et al. 2014a); Siwa Oasis, Gabal al-Dakror, 1 f (Soliman & Mohallal 2014); Siwa Oasis, Old Shaly, colony (Soliman & Mohallal 2014); – Siwa Oasis, Abu el-Sherouf [47], colony (Soliman & Mohallal 2014); – Siwa Oasis, El Zeytun [48], ruins of a Roman tomb, 8 March 2012: obs. remnants of a colony (Benda et al. 2014a); Siwa Oasis, Al-Senoseya (old city), 1 m (Soliman & Mohallal 2014). – Q e n a: Tempel von Denderah [49] (Oken 1816); temple de Denderah (Geoffroy 1818, 1828); temple de Denderah (Temminck 1835); Dendera, Ruinen des herrlichen Isis-Tempels, 1855: grosse Zahl (Frauenfeld 1856); Dendera (Kolenati 1857a); Denderah, Tempel, 6 February 1860: obs. inds. (Hartmann 1863, 1868); Dendera (Kolenati 1863); temple of Denderah, 6 March 1880: 17 m, 15 f, IMC (Anderson 1881); Denderah, 1880–1881: immense numbers (Anderson 1902); Denderah, 1897: 3 inds., ZFMK (von Lehmann 1964); Dendera, 19 March 1964: 1 f, SMF (Kock 1969); Dandara, Temple of Hathor, 27 April 1969: obs. a colony of some 500 inds., coll. 15 ms, 1 fa, 4 fs, IVB (Gaisler et al. 1972); Dandara, 38 inds., MQC (Qumsiyeh 1985); Dandara Temple, 1 f, SMNS, 11 m, 11 f, CMNH (Owen & Qumsiyeh 1987); Dandara, temple, 27 April 1969: 2 m, IVB (Benda et al. 2006, 2011b, 2014b); – Q e n a [50] (Sanborn & Hoogstraal 1955); Qena, 1972–1975 (Saoud & Ramadan 1976a, 1977a, b, d); Qena, 1 ind., FMNH (Qumsiyeh 1985); Qena, coll. inds. (Ramadan 1986); Qena, 1 f, FMNH (Owen & Qumsiyeh 1987); Quena province, inds. (El Garhy 2003). – S h a m a l S i n a': El Arish [51] (Hoogstraal 1962).

IMPRECISE RECORDS. Egypte (Geoffroy 1813b); Aegypt, 2 inds., ZMB (Lichtenstein 1823); in Aegypti speluncis atque sepulcris (Fischer 1829); Egypte, cavernes et tombeaux (Lesson 1834); Egypte (Presl 1834); Égypte, profondes excavations des montagnes (Temminck 1835); Egypt (Gray 1838); Egypt, 2 inds., BMNH (Anonymous 1839); Egypten (Wagner 1840); Aegypten, 1 ind., SMF (Rüppell 1842b); Egypt, 10 inds., BMNH (Gray 1843); Egypt, 4 inds., BMNH (Gray 1848); Égypte (Gervais 1854); Aegypten (Wagner 1855, Kolenati 1857a); Egypt, 4 inds., BMNH (Gray 1862); Aegypten (Kolenati 1863); Ägypten (Fitzinger & von Heuglin 1866); Oberägypten (Hartmann 1868); Ägypten (Fitzinger 1869b); Egypten (von Heuglin 1877); Egypt, 11 ma, 3 fa, 4 inds., BMNH (Dobson 1878); Egypte (Trouessart 1879); Aegypten, 1 ind., KLHB (Nehring 1886); Egypte, 2 inds., RNHL (Jentink 1887); Egypte, 5 inds., RNHL (Jentink 1888); Egitto, inds. (Sonsino 1896); Ægyptus (Trouessart 1897); Egypten (Palacký 1901); Upper Egypt, 2 m, 3 f (Anderson 1902); Ægyptus (Trouessart 1904); Aegyptus (Bezzi 1905); Egitto, 1 f (Senna 1905); Egitto, 2 m, MSNG (de Beaux 1931); Egypte (Gohar 1934); Egypt (Allen 1939, Jobling 1939); Egypte, 1 ma, 2 inds., MNHN (Rode 1941); Egypt (Hoogstraal 1955, 1956); Ägypten (Möhres & Kulzer 1955, 1956b); Egypt, inds. (Mohammed & Saoud 1964); Egypt, coll. inds. (El Sabbah et al. 1967); Egypt, 1 ind. (Dusbábek 1969); Ägypten, 1 ind., SMF (Kock 1969); Egypt (Madkour 1976b); Egypt, 1972–1975: 596 inds. (Saoud & Ramadan 1976b); A. R. Egypt, inds. (Madkour 1977c); Egypt, 10 inds., AMNH, BMNH, MCZ (Qumsiyeh 1985); Upper Egypt, 2 inds., BMNH (Qumsiyeh 1985); Egypt, 18 April 1862: inds. (Uchikawa & Kock 1989); Egypt, 13 fa, NMP (Benda et al. 2008); Egypt, 2 inds., YPM (Dornburg et al. 2011). – Upper Nile region, 1 ind., BMNH (Dobson 1878); Nil supérieur (Trouessart 1879); Oberrnil (Palacký 1901); Nile, 4 inds., USNM (Setzer 1952); Nile, 11 inds., BMNH, USNM (Qumsiyeh 1985). – Nubie, inds., RNHL, SMF (Temminck 1835); Nubien (Wagner 1840); Nubie (Gervais 1854); Nubien (Wagner 1855, Hartmann 1863, 1868, Kolenati 1863, Fitzinger & von Heuglin 1866, Fitzinger 1869b, von Heuglin 1877, Nehring 1886); Nubia (Flower 1932, Hayman 1949). – Sinai, 3 inds., USNM (Qumsiyeh 1985); Sinai, 2 f, USNM (Owen & Qumsiyeh 1987); [eastern Sinai] (Hoath 2003). – vicinity of Cairo [30–31] and Giza [16–27] Province, October 1959 – October 1961: 62 inds. (Mohammed & Saoud 1965). – Ein Urzarki-a [52], 3 inds., SMNS (Qumsiyeh 1985).

DISTRIBUTION. *Asellia tridens* belongs to the common bat species of Egypt, it has been found in 52 sites (Fig. 12; Table 2). It is the third most frequent bat of the country, recorded in all geographic regions of Egypt except the Nile Delta and Mediterranean Sea shore, i.e., it is present in all arid parts of the country and missing only in the humid littoral regions. Apart from Sinai, *A. tridens* is an abundant bat in all the occupied regions. Considering the number of reported localities, this species is one of the most frequent bat species in the Cairo Region and Western Desert, and in the Nile Valley, *A. tridens* is the second most common bat species (Table 2). Considering the extent of occurrence in Egypt, *A. tridens* is one of the most widespread bats, together with *Pipistrellus kuhlii* (Fig. 21). It is the most widespread bat in the Western Desert, where it occupies five oases (the highest number among the Egyptian bats) and moreover, the records of *A. tridens* are not concentrated only to oases as in other bats, but are known also from an open desert.

The Egyptian records of *A. tridens* are available from a rather narrow altitude range of –16–670 m a. s. l. (median 76.0 m, mean 98.8 m; Fig. 4, Table 3). The localities in the continental

African part of Egypt and in Sinai lie in altitude ranges very similar to each other; in the range of –16–510 m a. s. l. in the continent (median 76.0 m, mean 90.5 m), and of 13–670 m a. s. l. in Sinai (median 16.0 m, mean 233.0 m; Fig. 5, Table 4).

The current picture of *A. tridens* distribution in Egypt generally conforms to the view given by Qumsiyeh (1985); with the exception of the Red Sea shore and mountains, the numbers of records have increased in all occupied geographical regions, in the Western Desert even three times, in the Cairo Region about twice. The northernmost point of the Egyptian African distribution of *A. tridens* remains the site 10 km north of Cairo, as Kock (1969) already defined.

Qumsiyeh (1985: 46) reported an examination of three SMNS specimens of *A. tridens* labelled to originate from ‘Ein Urzarki-a’; however, he did not localise a site of such name within Egypt and included it among the Egyptian sites with ‘no exact locality’. Unfortunately, neither we found a site of this enigmatic name in Egypt or in another country of the *A. tridens* occurrence.

The occurrence of *A. tridens* in Egypt continues in the south and east to other segments of its distribution range. It directly extends to Sudanese Nubia, both in the Nile Valley and Red Sea shore (von Heuglin 1859, Hartmann 1863, Koopman 1975, Kaisila 1992, Benda et al. 2011b, 2014b), where this bat is the most common and widespread bat species (Kock 1969, Benda et al. 2011b). The Sinaitic occurrence continues with numerous records in the southern Holy Land (Mendelssohn & Yom-Tov 1999, Benda et al. 2010). Surprisingly, *A. tridens* remains an unknown bat from the eastern part of Libya, although the abundant occurrence in the Western Desert of Egypt could indicate a similar pattern of distribution also in the Libyan part of this arid region. However, in the western direction, *A. tridens* is known to occur only more than a thousand kilometres west of the Siwa Oasis, in the Fezzan occurrence spot (Benda et al. 2014b). On the other hand, in the desert parts of the Maghreb countries, this bat is a rather common faunal element (Puechmaille et al. 2012, Ahmim & Oubaziz 2017, Aulagnier et al. 2017).

TAXONOMY. *Asellia tridens* as a species was described based on a material from Egypt (Fig. 13); Geoffroy (1813b) reported its origin just in ‘Égypte’, while Geoffroy (1818: 133) in his part of the *Description de l’Égypte* reported the collection of the type series as follows: “J’ai trouvé le trident dans les plus profondes excavations des montagnes, en Égypte, et notamment dans les parties les plus reculées des tombeaux des rois, et du temple de Denderah.” Some of the oldest authors (Oken 1816, Temminck 1835) related the distribution of this bat in Egypt to these two sites – the Royal Tombs [of Thebes] and the Dendera Temple – and Anderson (1902: 101) again stressed the collection of the type series at two directly named sites, see as follows: “Geoffroy St.-Hilaire states that this species was found in the principal underground chambers and monuments of Egypt, mentioning among them the Tombs of the Kings and the temple of Denderah.” However, despite the clear specification of the collection sites, most authors defined the type locality of *A. tridens* just as ‘Egypt’ (Flower 1932, Allen 1939, Ellerman & Morrison-Scott 1951, Setzer 1952, Sanborn & Hoogstraal 1955, Harrison 1964, Gaisler et al. 1972, Atallah 1977, Corbet 1978, Harrison & Bates 1991, Corbet & Hill 1992, Bates & Harrison 1997, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000). Only Hollister (1918: 88) correctly defined the type locality of *A. tridens* as the ‘Tombs of the Kings and temple of Denderah, Egypt’.

On the other hand, based on the information by Geoffroy (1818), Kock (1969: 122) suggested to restrict the type locality as follows: “Grab der Könige (= Theben, Luxor) und Dendera. Theben als der erstgenannte gilt als Fundort des Typus”. Subsequently, Koopman (1975: 395) wrote as follows: “Geoffroy mentioned two localities, the Tombs of the Kings (near Luxor) and the Temple of Denderah (near Qena); following Kock [1969 ...], I restrict the type locality to the Tombs of the Kings, near Luxor, Qena Province, Egypt.” Following these two authors, Qumsiyeh (1985: 41–42; and similarly, also Qumsiyeh 1996: 105) mentioned about the origin of the type series:



Fig. 13. Images of *Rhinolophus tridens* Geoffroy, 1813 [= *Asellia tridens*], *Nyctinomus Aegyptiacus* Geoffroy, 1818, and *Plecotus auritus* [(Linnaeus, 1758)] (l'oreillard d'Égypte) [= *P. christii* Gray, 1838] published by Geoffroy (1818: Plate 2).

“É. Geoffroy St.-Hilaire (1818: 127) mentioned two localities for this species in Egypt, Tomb of the Kings (Luxor) and Dendera. Kock (1969) restricted the type locality to Thebes (= Luxor).” Some other authors (Koopman 1993, Simmons 2005, Benda et al. 2006, 2011b, Monadjem 2019a) finally defined the type locality as ‘near Luxor, Egypt’ or ‘Thebes, Egypt’.

However, Rode (1941: 86) reported the type series of *A. tridens* composed of three alcohol specimens housed in the MNHN collection, all labelled to come just from ‘Egypte’. There is no evidence available, suggesting that the syntypes (or at least one of them) come from Thebes and not from Dendera. The restriction of the type locality to Thebes, made repeatedly by Kock (1969) and Koopman (1975), is unjustified and the type locality remains the same as it was mentioned by the first author (Hollister 1918), i.e., ‘Valley of the Kings, Thebes [25°44’25”N, 32°36’06”E], and Dendera Temple [26°08’33”N, 32°40’14”E], Egypt’. These sites are situated ca. 45 km from each other and thus, there is no need to restrict the type locality to one of them, since both sites are inhabited by the same taxon (see below and Kock 1969, Gaisler et al. 1972, Qumsiyeh 1985, and Benda et al. 2006).

The taxonomic affiliation of the Egyptian populations of *A. tridens* seems to be indisputable, since the description of the species is based on the material from Upper Egypt, they were assigned to the nominotypical subspecies by most of the involved authors (Dobson 1878, Anderson 1881, 1902, Hollister 1918, de Beuax 1931, Allen 1939, Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Hoogstraal 1962, Hayman & Hill 1971, Gaisler et al. 1972, Atallah 1977, Corbet 1978, Koopman 1994, Qumsiyeh 1996, Horáček et al. 2000).

Such an opinion conforms to the results of the first revisions of geographical variation in *A. tridens* (Harrison 1957, 1964) that found *A. t. tridens* in continental Egypt and eastern Arabia, while in north-western Arabia including Sinai the author reported ‘intermediate populations’ between the Egyptian small-sized nominotypical subspecies and the large-sized *A. t. murraiana* (Anderson, 1881) in Iraq, Pakistan, and Yemen. However, these observations indicated certain morphometric differences among the Egyptian populations of *A. tridens*, at least between the continental and Sinaitic bats. Kock (1969), who revised an extensive set of published data on *A. tridens* from the most of its distribution range, based on the clustering of body-size groups, suggested existence of two subspecies in the whole species range. He found both in Egypt; *A. t. tridens* in southern Egypt, Somalia and eastern Arabia, and *A. t. murraiana* in northern Egypt and the northern Middle East, including Sinai, plus the Maghreb. Although Kock (1969) considered various remaining populations of *A. tridens* in Africa and Arabia to be of an uncertain taxonomic position within the species, he did not accept any intermediate stages for them. Qumsiyeh (1985) rather supported the previous view by Harrison (1957, 1964) and considered the north-Egyptian and Levantine populations staying morphometrically between the south-Egyptian small-sized bats (*A. t. tridens*) and the Iraqi large-sized bats (*A. t. murraiana*). On the other hand, a geographically broadly based taxonomic analysis of *A. tridens* by Owen & Qumsiyeh (1987) classified within the species range only two subspecies; *A. t. tridens* was mentioned to occur in most of the African countries including Egypt and Sinai, and in Yemen, while *A. t. murraiana* in two separate ranges, in the Middle East (except for Yemen) and West Africa. However, these results were not fully accepted in respect to the intraspecific division of *A. tridens* and particular ranges of the subspecies by the subsequent authors (e.g., Harrison & Bates 1991, Koopman 1993, 1994, Mendelsohn & Yom-Tov 1999, Horáček et al. 2000, Simmons 2005).

A dissimilar picture of phylogenetic relations within the species rank of *A. tridens* was showed by the revision of the genus *Asellia* Gray, 1838 by Benda et al. (2011b) combining the approaches of morphometric and molecular genetic analyses. It identified four lineages in *A. tridens*, geographically well separated, (1) in northern and eastern Africa, including Egypt and the Maghreb, (2) in West Africa, (3) in northern Middle East, and (4) in south-western Oman (Shisr oasis).

No significant metric or morphological differences were found among these four lineages, they contained both large-sized and small-sized morphotypes (formerly assigned to two subspecies, *murraiana* and *tridens*, see above) and diverged only in genetic distances. The divergences among these geographically limited groups of haplotypes were rather low, 2.1–3.4% of K2p distance, and the largest divergence was found between the African and Middle Eastern pairs of lineages, supporting their taxonomic separation. Based on these results, Benda et al. (2011b) suggested to consider these two large geographical population groups as two subspecies, *A. t. tridens* in Africa and *A. t. murraiana* in Asia (type locality: Karáčí [= Karachi, Sind, Pakistan; 24°51'N, 67°01'E] and Bushire, Persian Gulf [= Bushehr, Iran; 28°59'N, 50°50'E]; Anderson 1881: 113).

However, while the results of the revision by Benda et al. (2011b) conform to the traditional opinions on taxonomic status of the Egyptian continental populations of *A. tridens*, the affiliation of the Sinaitic populations still remains open, since samples from Sinai and the Levant as well were not included into the genetic part of the revision by Benda et al. (2011b). The geographical delimitation of the two subspecies is supposed to be directed north-south along the Red Sea and thus, the Sinaitic bats could belong either to the African nominotypical form, or to the Asian lineage *A. t. murraiana*. An additional molecular genetic analysis of *A. tridens* by Bray & Benda (2016), complemented by new samples, demonstrated a presence of the African lineage (*A. t. tridens*) in the west of Saudi Arabia, suggesting either that the eastern margin of the range of the African lineage runs rather through the Arabian Peninsula, or that genetic exchanges between the populations of north-eastern Africa and Arabia are in work. If the former possibility is valid, the Sinaitic populations belong more likely to the nominotypical form.

Anyway, the intraspecific taxonomic arrangement of *A. tridens* suggested by Benda et al. (2011b) was accepted by Monadjem (2019a).

Taphozous perforatus Geoffroy, 1818

RECORDS. Published data: A s w a n: Abu Simbel [1], late in May 1900: more abundant (Flower 1932); Abu Simbel, 1 ind., BMNH (Qumsiyeh 1985); – Tombs opposite Assuan [2], 2 m (Anderson 1902); Assuan, 1910: 1 ind., ZFMK (von Lehmann 1964); – El A'aqab [3], under a road bridge, 25 January 2010: net. 1 ma, NMP, det. calls of several inds. (Benda et al. 2014a, Uvizi et al. 2019); El A'aqab, 1 ind., NMP (Karmáčková 2017); – Elkab necropolis [4], upper mastaba tomb, 1996: remains of 1 ind. (Gautier 2005); – Ombos [5] (Oken 1816 [as *T. aegyptiacus, perforatus*]); Ombos (Geoffroy 1818, 1828); Ombos (Desmarest 1820); Ombos (Fischer 1829); Ombos, anciens tombeaux (Lesson 1834); Ombos (Presl 1834); Ombos (Temminck 1838a); Ombos (Temminck 1841); – Cavern in desert hills east of Philae [6], 4 m, 5 f (Anderson 1902); Philae, 3 inds., BMNH (Qumsiyeh 1985). – E l B a h r E l A h m a r: Koseir [7], coll. inds. (Klunzinger 1878). – E l B e h e i r a h: Western Desert (Wadi Natroun) [8] (Sanborn & Hoogstraal 1955); Monastery Wadi Natroun, Western Desert, 2 October 1952: inds. (Macy et al. 1961); Wadi Natroun Monastery, inds. (Heyneman & Macy 1962); Wadi Natroun, ancient monastery buildings, colonies (Hoogstraal 1962); Wadi El Natrun, 9 inds., FMNH (Qumsiyeh 1985). – E l E s m a' i l i y a h: Tell el-Maskhuta [9] (Boessneck 1988). – E l F a y u m: caves at the edge of Faiyum [10], 23 January 1950: inds. (Macy et al. 1961); Faiyum, inds. (Heyneman & Macy 1962); Faiyum, 3 inds., USNM (Qumsiyeh 1985); El Faiyum (Wassif 1995); Fayoum, inds. (Garó & El Garhy 2005). – E l J i z a h: Abou roach [11], 1 f, NHMB (Engelmann 1912, Revilliod 1913); north base of Mount Abu Rauwash, 1946: 6 m, 9 f, USNM (Setzer 1952); Abu Kawash, November 1952: inds. (Jobling 1954); Mt. Abu, Rauwash, inds. (Jobling 1954); Abu Rawash, 19 December 1952: 1–2 inds. (Maa 1961); cave at N. base of Mt. Abu Rawash, 27 December 1946: inds. (Maa 1961); caves back of Abu Rauwash, 20–21 January 1950, 9 & 21 January 1952: inds. (Macy et al. 1961); Abu Rawash, inds. (Heyneman & Macy 1962); Abu Rawash, January, March, October–December (Hoogstraal & Traub 1963); Abu Roash, 4 inds., SMF (Kock 1969); Mt. Abu Rawash, cave at N Base of, 27 December 1946: 45 inds. (Haas & Tomich 1973); Abu Rawash, 8 m, 22 f, November 1947: 2 m, 1 f, July 1959: 3 m, ASUC (Wassif et al. 1984); Abu Rawash, 33 inds., FMNH, HZM, MVZ, NHMB, USNM (Qumsiyeh 1985); Abu Rawash, coll. inds. (Morsy et al. 1986a, b); Abu Rawash, inds. (Garó & El Garhy 2005); Abo Rawash, 2015–2016: 27 inds. (Ali et al. 2017); – 16 miles SW Cairo [12], 1 ind., USNM (Qumsiyeh 1985); – Gizeh [13], Tomb of the Hyæna, 1 m (Anderson 1902); Giza, 1908: 1 ind., 1911: 1 ind. (Flower 1932); Giza (Sanborn & Hoogstraal 1955); Giza Pyramid, 14 May 1951, 12 March 1952, & 31 January 1953: inds. (Macy et al. 1961); Giza Pyramid, 14 May 1951: ind. (Dubois 1962); Giza, pyramids, inds. (Heyneman & Macy 1962); Giza Pyramid, April (Hoogstraal & Traub 1963); Pyramids of Giza, tomb at, 22 November 1946: 1 ind. (Haas & Tomich 1973); Giza, 28 inds., FMNH (DeBlase

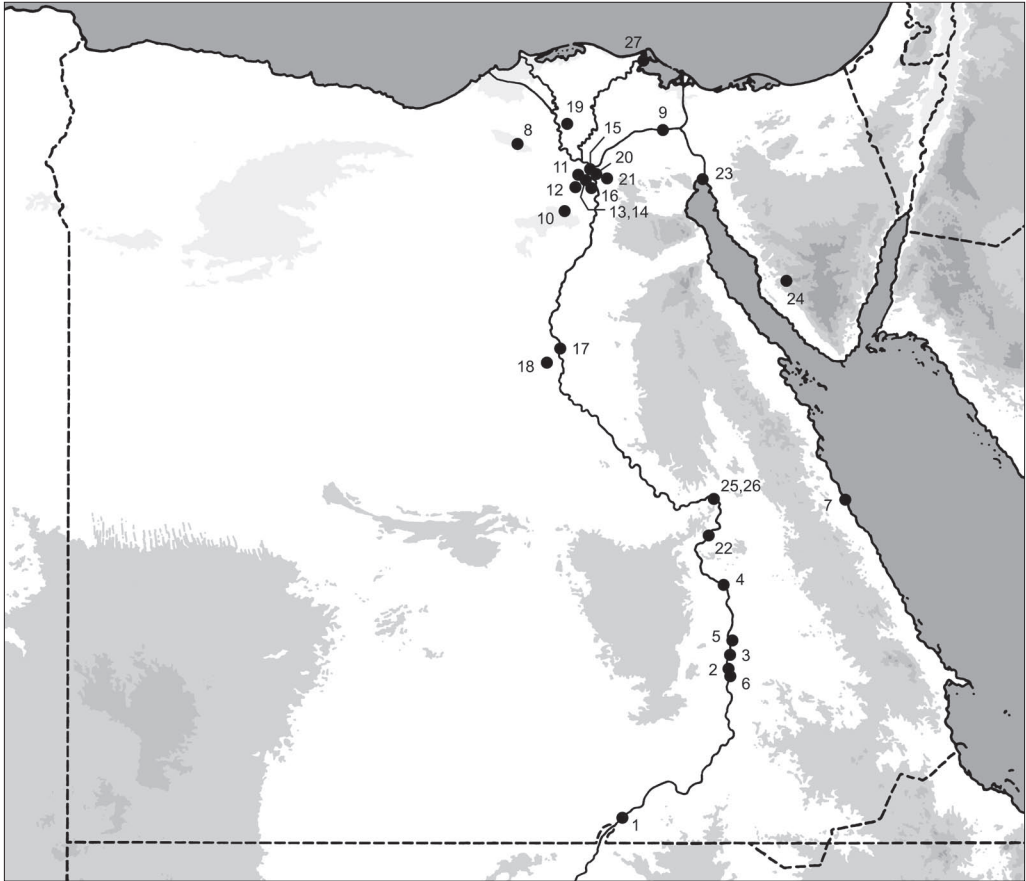


Fig. 14. Records of *Taphozous perforatus* Geoffroy, 1818 in Egypt; for explanations see Fig. 3.

1980); Giza, 2 inds., BMNH (Qumsiyeh 1985); caves near Giza Pyramids, coll. 6 f (El-Dawy & Ibrahim 1994); – 2 km from Giza City [14], 15 inds., USNM (Qumsiyeh 1985); – Imbana [15], Abu Rawash, 29 March 1954: 1 ind. (Maa 1961); – Sakkara [16], 12 May 1951: inds. (Jobling 1954); Sakkara tombs, inds. (Heyneman & Macy 1962); Sakkara, October (Hoogstraal & Traub 1963); Sakkara (Madkour 1978); Saqqara, 69 inds., FMNH, USNM (Qumsiyeh 1985); Sakkara, coll. inds. (Morsy et al. 1986a, b); Saqqara area, 2012–2013: coll. 211 inds. (Soliman 2015); Saqqara, 2012–2013: coll. 48 m, 43 f (Mansour et al. 2016, 2017). – El Minia: Beni Hasan [17], 1 ind. (Anderson 1902); Beni Hassan, 1 ind., BMNH (Qumsiyeh 1985); – Tuna el-Gebel [18], necropolis, 1 ind. (Boessneck & von den Driesch 1987). – El Monfya h: El Shohada [19], inds. (Kandeil et al. 2020). – El Qahira h: near Cairo [20], 24 January 1901: 1 ind. (Rothschild 1903, Hopkins & Rothschild 1956); Cairo Area (Hoogstraal 1952); Cairo, 3 October 1952: 1 ind. (Traub 1954); Cairo, 24 January 1901: 1 ind. (Hubbard 1960); Cairo, Sultan Hassan Mosque, June, October (Hoogstraal & Traub 1963); Sultan Hassan Mosque, March 1952: 1–2 inds. (Maa 1964); Cairo, 1949: 1 ind. (Haas & Tomich 1973); Cairo, 38 inds., 1941: 4 inds., 1946: 35 inds., ASUC (Wassif et al. 1984); Cairo, 6 inds., FMNH (Qumsiyeh 1985); nr Cairo, 24 January 1901: 1 ind. (Lewis 2006); – Wadi Degla [21], rec. calls (Dietz 2005b). – El Uqsar: Theben [22], Gräbern der Könige (Oken 1816 [as *T. aegyptiacus*, *perforatus*]); Thèbes, tombeaux des rois (Geoffroy 1818, 1828, Desmarest 1820); In sepulcris regis apud Ombos Thebasque Aegypti (Fischer 1829); Thèbes, anciens tombeaux (Lesson 1834); Thèby (Presl 1834); Theben, in de graftomben der Koningen (Temminck 1838a); Königsgräber von Theben (Wagner 1840); Thèbes (Temminck

1841); Königsgräbern von Theben (Fitzinger 1870b); Temple of Karnak, 17 January 1881: 3 m, IMC (Anderson 1881, Ghosh 2008); nr. Luxor, November 1938 – April 1939: 1–2 inds. (Maa 1961); Luxor (Hoogstraal 1962); Luxor, Valley of Queens, tomb, 30 April 1969: obs. a colony of some 200 inds., coll. 19 ma, 2 ms, 16 fa, IVB (Gaisler et al. 1972); Luxor, Valley of the Queens, 30 April 1969: 1 ma, 1 fa, IVB (Gaisler & Baruš 1978); Luxor (Madkour 1978); Luxor, 34 inds., BMNH, USNM (Qumsiyeh 1985); Luxor, Kurna, 7 inds., FMNH (Qumsiyeh 1985); El Uqsur (Thebes), on the Nile bank, 26 January 2010: det. calls of several foraging inds., 27 January 2010: det. calls of several foraging inds. (Benda et al. 2014a); El Uqsur (Thebes), tombs at the main road to the Valley of the Kings, 27 January 2010: obs. a colony of ca. 25 inds., coll. 1 ma, 1 md, 1 fa, 1 fs, NMP, 12 January 2011: obs. a colony of ca. 150 inds., exam. 4 ma, 2 mj, 3 fa (Benda et al. 2014a); Luksor, 5 inds., NMP (Karmáčková 2017, Uvizl et al. 2019). – *E s s u w a i s*: El-Suez Governorate [23], certain uninhabited and deserted areas, coll. inds. (Sakr & Ramadan 2010, Taki-El-Deen et al. 2013). – *J a n u b S i n a'*: Feiran Oasis [24], Wadi Feiran, garden el Braga, 11 August 2005: obs. & rec. at least 2 inds., 12 August 2005: rec. at least 1 ind. (Dietz 2005b, Dietz & Maltby 2006); Feiran, El Braga Garden, 11 August 2005: obs., det. & rec. min. 2 inds., 12 August 2005: det. & rec. min. 1 ind. (Benda et al. 2008). – *Q e n a*: Denderah [25], 6 February 1860, inds. (Hartmann 1863); Dandara, 1 ind., MQC (Qumsiyeh 1985); – Qena [26] (Sanborn & Hoogstraal 1955); localities around Qena City, coll. 10 m, 8 f (Yaseen et al. 1994).

IMPRECISE RECORDS. Aegypt, 2 inds., ZMB (Lichtenstein 1823); Egypt (Gray 1838); Egypten (Wagner 1840); Egypte (Temminck 1841); Aegypten, 1 ind., SMF (Rüppell 1842b); Égypte (Gervais 1854); Aegypten (Wagner 1855, Hartmann 1868); Egypt (Dobson 1875); Egypte (Trouessart 1879); Aegypten, 1 ind., KLHB (Nehring 1886); Egypte, 2 inds., RNHL (Jentink 1887); Egypte, 4 inds., RNHL (Jentink 1888); Ægyptus (Trouessart 1897); [Aegypten] (Looss 1899); Egypten (Palacký 1901); Aegypten, 1 ind. (Speiser 1901, 1904); Ægyptus (Trouessart 1904); Aegyptus (Bezzi 1905); Egypt, 1 ind. (Boulenger 1926); Egypt, 1 ind. (Megitt 1927); Egypt (Allen 1939); Aegypten, 1 ind. (Karaman 1939); Egypte, 1 m(?)a, MNHN (Rode 1941); Egypt (Hoogstraal 1955, 1956); Ägypten (Möhres & Kulzer 1956b); Egypt, 62 inds. (Wells & Randall 1956); Egypt (Myers et al. 1962); Egypt, inds. (Mohammed & Saoud 1964); Egypt, coll. inds. (El Sabban et al. 1967); Egypt, inds. (Theodor 1968); Egypt, 28 inds. (DeBlase 1972a); Egypt (Madkour 1976b); A. R. Egypt, inds. (Madkour 1977c); Egypt, 17 inds., BMNH, SMNS, ZMUC (Qumsiyeh 1985); Egypt, inds. (Morsy et al. 1987a); Egypt, 12 m, 8 f (Riad et al. 2000); Egypt, February 2013 – April 2015: coll. 82 inds. (Shehata et al. 2016); Egypt, 2016–2017: 11 inds. (Kandeil et al. 2019). – Nubien (Hartmann 1863); Nubien (Fitzinger & von Heuglin 1866, Hartmann 1868, Fitzinger 1870b [as *T. perforatus* and *T. senegalensis*]); Nubien (von Heuglin 1877 [as *T. senegalensis*]); Nubia (Senna 1905, Flower 1932). – Neder-Egypte (Temminck 1838a); Mittel- und Ober-Ägypten (Fitzinger & von Heuglin 1866, Fitzinger 1870b). – Giza [11–16] and/or Damietta [27] Governorates, May–October 2016: net. 11 inds. (El Taweel et al. 2020). – vicinity of Cairo [20–21] and Giza [11–16] Province, October 1959 – October 1961: 82 inds. (Mohammed & Saoud 1965). – Cairo [20–21], El Fayum [10] and Giza [11–16] governorates, 20 inds. (Morsy et al. 1987b).

DISTRIBUTION. *Taphozous perforatus* is a medium-frequent bat species in Egypt, it has been found in 27 sites (Fig. 14; Table 2). The prevailing numbers of localities are concentrated to two geographic regions of Egypt, the Cairo Region and Nile Valley. In the latter region, from where almost a half of the Egyptian records is available, the sites are scattered along the whole length of the Nile in the country. The second largest number of records is known from the Cairo Region and most probably, also a majority of the geographically unspecified records of *T. perforatus* from Egypt originate from this area. Few records are available also from the north-eastern part of Egypt, three sites are known from the Nile Delta, two from the Red Sea shore, and one site from each of the Western Desert (Wadi El Natrun) and Sinai (Feiran Oasis).

The Egyptian records of *T. perforatus* are available from a rather narrow altitude range of –10–670 m a. s. l. (median 73.0 m, mean 91.5 m; Fig. 4, Table 3). The localities in the continental African part of Egypt lie in a much narrower range of lowland altitudes (–10–190 m a. s. l.; median 70.0 m, mean 68.4 m), while the single Sinaitic locality lies in the medium-high altitude of 670 m a. s. l. (Fig. 5, Table 4).

The picture of the Egyptian distribution of *T. perforatus* given by Qumsiyeh (1985) corresponds only partially with the current view. This author did not mention the records from Suez (Red Sea shore) and Feiran (Sinai) as well as from the Nile Delta. Currently, the number of records in the Nile Valley has increased almost twice in comparison with that given by Qumsiyeh (1985), while in most of other regions the record numbers remain in comparable levels to the Qumsiyeh's (1985) numbers. On the other hand, in the distribution description and map of *T. perforatus*, Qumsiyeh

(1985: 23–24) presented a record erroneously localised to the Nile Delta (identically as in *R. microphyllum*, see above). However, such localisation is based on Qumsiyeh's (1985) misinterpretation of the location of Beni Hasan (Anderson 1902). This site (an ancient necropolis) lies in the Nile Valley ca. 20 km south of El Miniya [ca. 27°56'N, 30°53'E], but Qumsiyeh (1985) regarded it a village of the same name in the Ed Daqahliyah Governorate [ca. 30°54'N, 31°41'E].

The occurrence of *T. perforatus* in Egypt continues to other segments of its distribution range mainly in the south, it directly extends to Sudanese Nubia (Hartmann 1863, Kock 1969, Koopman 1975); in the Nile Valley of this region *T. perforatus* belongs to the most common bat species (Koopman 1975). The Sinaitic occurrence spot of this bat has not a direct continuity in the east, *T. perforatus* is not known from the deserts of the southern Levant (Mendelssohn & Yom-Tov 1999, Benda et al. 2010). On the other hand, it is known from several sites in the central and northern parts of the Holy Land, the geographical gap between the Egyptian and Israeli localities is about 230–270 km (cf. Korine & Pinshow 2004). The Egyptian belt of *T. perforatus* occurrence represents the westernmost margin of the Palaearctic part of the distribution range of this bat, it is not known from Libya and the Maghreb (Puechmaile et al. 2012, Benda et al. 2014b, Ahmim & Oubaziz 2017, Aulagnier et al. 2017). On the other hand, *T. perforatus* has a broad distribution range in the savannahs of sub-Saharan Africa (Kock 1969, Taylor 2013, Monadjem et al. 2020); besides Africa and the Levant, it occurs also in southern Arabia and south-western continental Asia (Harrison & Bates 1991, Bates & Harrison 1997, Benda et al. 2011c, 2012b).

TAXONOMY. *Taphozous perforatus* as a species was first described based on material from Egypt, by Étienne Geoffroy Saint-Hilaire (1818) in the *Description de l'Égypte* (Fig. 15); Geoffroy (1818: 128) reported the collection of the type series as follows: “J’ai trouvé le taphien d’Égypte dans des retraites très-profondes, à Ombos, et à Thèbes dans les tombeaux des rois.” The oldest authors related the distribution of this bat in Egypt to these two localities (Kom Ombo and Thebes), see Oken (1816), Desmarest (1820), Fischer (1829), and Temminck (1838a, 1841). Wagner (1840) and Fitzinger (1870b) mentioned this bat only from the ‘Königsgräbern von Theben’. Some other old authors mentioned this bat just from ‘Egypt’ without specification (Lichtenstein 1823, Gray 1838, Gervais 1854, Wagner 1855, Hartmann 1868, Dobson 1875, 1878, Trouessart 1879, 1897, 1904, Palacký 1901).

Considering the above report by Geoffroy (1818), the specification of the type locality of *T. perforatus* may seem clear, and following Geoffroy, it was given by e.g., Hollister (1918: 73): ‘Ombos and Thebes, Egypt’; Flower (1932: 384): ‘Upper Egypt (Kom Ombo and Thebes)’; or De Beaux (1939: 172): ‘Ombos (Kom Ombo) e Tebe, nelle tombe dei Re’. However, Allen (1939: 66) and Ellerman & Morrison-Scott (1951: 104) defined the type locality of *T. perforatus* as ‘Egypt’, and perhaps for this broad definition in two authoritative checklists, several additional authors continued to identify the type locality as ‘Egypt’ (e.g., Setzer 1952, Sanborn & Hoogstraal 1955, Aellen 1957, Harrison 1964, Corbet 1978, Harrison & Bates 1991, Corbet & Hill 1992, Bates & Harrison 1997, Mendelssohn & Yom-Tov 1999) or as ‘Upper Egypt’ (Gaisler et al. 1972).

Kock (1969: 74) quoted the type locality correctly as ‘Ombos (= Kom Ombo) und Theben, Oberägypten’; on the other hand, he simultaneously tried to restrict the type locality of *T. perforatus* only to one of the respective sites and mentioned the following arguments: “Die Beschreibung von *perforatus* ist nicht zu mißdeuten; Geoffroy (1818) nennt an Fundorten seiner Art Ombos und Theben in Ägypten. [...] Gemäß Geoffroy’s Aufzählung soll für *perforatus* als eigeschränkter Fundort des Typus Ombos (= Kom Ombo, zw. Edfu und Assuan) gelten, [...]” However, Geoffroy (1818) did not report the collection of the type specimen/series from a single site (see above).

After this, Koopman (1975: 370) and Qumsiyeh (1985: 23) simply stated identically as follows: “Kock [...] restricted the type locality to Kom Ombo”; however, in this way they did not show



CHAUVE-SOURIS D'ÉGYPTE.

1 TAPHIEN PERFORÉ. 2 ROUSSETTE D'ÉGYPTE.

Requet. 50

Fig. 15. Images of *Taphozous perforatus* Geoffroy, 1818 and *Pteropus Aegyptiacus* Geoffroy, 1810 [= *Rousettus aegyptiacus*] published by Geoffroy (1818: Plate 3).

whether they accepted such a restriction or not. On the other hand, several subsequent authors clearly accepted the Kock's restriction as they quoted only Kom Ombo as the type locality of *T. perforatus* (Koopman 1993, Qumsiyeh 1996, Horáček et al. 2000, Simmons 2005, Benda et al. 2012b, Taylor 2013, Lanza et al. 2015, Bonaccorso 2019, Monadjem et al. 2020).

According to Anderson (1902) and Rode (1941), only one type specimen of *T. perforatus* was preserved in the MNHN collection from those collected by Geoffroy (1818); it was designated as the lectotype by Rode (1941), while the whereabouts of possible remaining specimens are unknown. Anderson (1902: 138) did not mention the exact labelling of the type specimen, Rode (1941) mentioned 'Egypte' as the locality associated with the lectotype. However, considering this information and the data by Geoffroy (1818), there is no evidence that could indicate one of the sites to be restricted as the type locality of *T. perforatus* and the other site to be rejected. Until such evidence is available, i.e., until the exact origin of the lectotype specimen is identified indisputably, the type locality of *T. perforatus* should be treated as 'Kom Ombo [24°27'08"N, 32°55'42"E] and Thebes [25°44'25"N, 32°36'06"E], Upper Egypt', in accordance with the indication by Geoffroy (1818). We consider the restriction made by Kock (1969) unjustified.

The taxonomic affiliation of the Egyptian populations of *T. perforatus* is clear; since the description of the species was made based on bats from southern Egypt, all involved authors assign them to the nominotypical subspecies (Allen 1939, Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Hoogstraal 1962, Harrison 1964, Kock 1969, Gaisler et al. 1972, Koopman 1975, 1994, Qumsiyeh 1985, Horáček et al. 2000, Taylor 2013, Uvizi et al. 2019). The subspecies of *T. perforatus* are characterised only by slight differences in pelage colouration, the nominotypical one being greyish brown (Thomas 1915a, Kock 1969, Koopman 1975). The extent of the distribution range of this subspecies varies under various taxonomic concepts; some authors considered *T. p. perforatus* to be distributed only in Egypt per se plus Nubia (Allen 1939, Koopman 1975, 1994), some authors in Egypt, most of the Sudan, and West Africa (Kock 1969, Qumsiyeh 1985), and the most extreme view was expressed by Corbet (1978), who did not see the delimitation of intraspecific taxa within the species rank of *T. perforatus* really substantiated. The revision by Uvizi et al. (2019) using the molecular genetic analysis to evaluate variation of *T. perforatus* found no signal of phylogenetic separation among the populations of West Africa, Egypt, Sudan, Djibouti, southern Arabia, and Iran. Hence, at least these segments of the species range should be considered to be occupied by the nominotypical subspecies of *T. perforatus*. This conclusion challenges the taxonomic position of *T. p. haedinus* Thomas, 1915, a subspecies regarded to occur in eastern Africa and southern Arabia (Thomas 1915a, Harrison 1964, Kock 1969, Koopman 1975, 1994, Harrison & Bates 1991, Horáček et al. 2000, Bonaccorso 2019, etc.), with the type locality Chanler Falls, Eusso Nyiro, British East Africa [= Gotu Falls, Kenya; 00°46'48"N, 38°04'51"E] (Thomas 1915a: 63).

Taphozous nudiventris Cretzschmar, 1830

RECORDS. **Published data:** A s y u t: Assiut Governorate [1], different localities, coll. 41 inds. (Abed et al. 2005b). – B a n i S u e f: Pyramiden von Maidum [2], 3 December 1986: 1 ind., ZFMK (Benda et al. 2006, Benda & Gaisler 2015). – E l B a h r E l A h m a r: Kosseir = Quseir [3], Rote Meer-Küste Ägypten, 1897: 1 f, SMNS (Kock 1981); Quseir, 1 ind., SMNS (Qumsiyeh 1985). – E l E s m a' i l i y a h: Tell el-Maskhuṭa [4] (Boessneck 1988). – E l F a y u m: Faiyum [5] (Sanborn & Hoogstraal 1955); Kom O-Shim caves, inds. (Heyneman & Macy 1962); Lake Karoun (near), June (Hoogstraal & Traub 1963); Lake Qarun, 21 inds., FMNH (Qumsiyeh 1985); Fayoum, inds. (Garó & El Garhy 2005); – Gebel el Lahun [6], Fayum, Beni Suef, 8 August 1988: 3 f, ZFMK (Benda et al. 2006, Benda & Gaisler 2015). – E l G h a r b i y a h: Tanta [7], [Tanta University], Faculty of Science, rooms and laboratories, great numbers throughout the year, 3 August 1975: coll. 2 ma, 3 fa (Madkour 1977b); Tanta (Madkour 1978). – E l J i z a h: Aburoash [8] (Flower 1932); Abu Rauwash, 1924: 3 m, 2 inds., MVZB (Setzer 1952); Abu-rawash, 39 inds. (Rifaat et al. 1967); Abu Rawash (Baruš 1973); Abu Rawash, vicinity of the village, 1 ind. (Černá & Ryšavý 1976); Abu Rawash (Madkour 1978); Abu Rawash, 2 m, 25 inds.,

1946: 3 inds., October 1947: 1 m, 1 f, June 1960: 1 m, March 1966: 1 m, 1 f, June 1966: 4 fa, 1fs, July 1966: 9 m, 6 f, August 1966: 9 m, 6 f, September 1966: 7 m, 2 f, October 1966: 3 m, April 1967: 4 f, May 1967: 8 f, August 1967: 8 fa, 1fs, July 1968: 1 m, ASUC (Wassif et al. 1984); Abu Rawash, 12 inds., BMNH, FMNH, MVZ, USNM (Qumsiyeh 1985); Abu rawash (Wassif 1995); Abu Rawash, inds. (Garó & El Garhy 2005); Abu Rawash, 15 & 17 June, 10 July, 15 September & 18 October 1971: 4 m, 3 f, 12 inds., NMP (Benda et al. 2006, Benda & Gaisler 2015); Abu-Rawash, late March 2004: coll. inds. (El-Desouki et al. 2006, Attia et al. 2007a, b); Abu-Rawash, March–October: coll. 20 fa (Mansour et al. 2006a, b); Abo-Rawach, inds. (Selim & El Nahas 2012); Abu-Rawash, 2010 and 2011: coll. 20 inds. (Selim & El Nahas 2015); – Abusir [9], tombs of Abusir South, coll. remains of 6 inds. (Pokorný et al. 2009); – Bahariya Oasis, Bawiti [10], 16 October 2011: det. tens of foraging inds. (Benda et al. 2014a); – Bahariya Oasis, Bawiti [11], a volcanic mountain at the NW edge of the Bahariya Oasis, crevices in rocks, 17 October 2011: obs. tens of roosting inds., coll. 2 mj, 1 fa, NMP (Benda et al. 2014a); Al Bahariya, 17 October 2011: 2 m, 1 f, NMP (Benda & Gaisler 2015); – Pyramiden von Gize [12], häufig (Cretzschmar 1830); Pyramiden von Gize (Wagner 1840); commun dans les cavernes et particulièrement dans les Pyramides (Temminck 1841 [as *T. nudiventer*]); Pyramiden von Gizeh (Fitzinger 1870b); pyramides de Ghizeh, 1 ind. (Looss 1896); Gizeh, 1 f (Anderson 1902); Ghizeh, 2 f, NHMB (Engelmann 1912); Ghizeh, 1 m, NHMB (Revilliod 1913); Gizeh-Pyramiden, 1 m, SMF (Mertens 1925); Giza, the road between Giza town and Giza Zoological Gardens, 23 May 1901: coll. 1 f (Flower 1932); Giza (Sanborn & Hoogstraal 1955); [El Jizah], Giza, Mycerinus Pyramid, 1 March 1955, 14 July 1959: inds. (Ussinger 1960, 1966); Giza-Pyramiden, 5 inds., SMF (Kock 1969); Pyramids of Giza, 20 April 1969: 1 fj, IVB (Gaisler et al. 1972); Giza, pyramids, 22 May 1971: 1 m, 1 f, MUB (Gaisler et al. 1972); Giza (Baruš 1973); Giza, 1972–1975 (Saoud & Ramadan 1977b, d); Giza Governorate, inds. (Madkour et al. 1982); Giza Pyramid, June 1966: 2 f, July 1966: 1 m, August 1966: 1 m, ASUC (Wassif et al. 1984); Giza Pyramids, 24 inds., BMNH, FMNH, NHMB, USNM (Qumsiyeh 1985); Giza City, 30 inds., AMNH, BMNH, CMNH (Qumsiyeh 1985); Giza, 1 ind., TTU (Hood & Baker 1986, Hooper 2003, Hooper & Van Den Bussche 2003); Giza Governorate, coll. inds. (Ramadan 1986); Giza, 13 inds. (Robbins & Sarich 1988); caves near Giza Pyramids, coll. 4 f (El-Dawy & Ibrahim 1994); Giza (Wassif 1995); Gizeh, before 1824: 1 ind., SMF (Benda et al. 2006); Gizeh, pyramids, 20 April 1969, 22 May & 15 September 1971: 1 m, 2 f, 2 inds., IVB, MUB, NMP (Benda et al. 2006); Giza, Abu Bur, pyramids, 15 September 1971: 4 inds., NMP (Benda et al. 2008); Gizeh, pyramids, before 1824, 20 April 1969, 22 May & 15 September 1971: 1 m, 2 f, 3 inds., IVB, MUB, NMP, SMF (Benda & Gaisler 2015); – Daschur Pyramide bei Mazghouna [13] (= 29.45.N, südl. Helwan), ZFMK (Kock 1969); Dahshour, August 1960: 1 f, September 1964: 2 m, 1 f, October 1964: 2 f, April 1966: 13 m, 7 f, May 1966: 3 m, 3 f, June 1966: 4 m, 2 f, July 1966: 1 m, 20 f, ASUC (Wassif et al. 1984); Dashur Pyramids, 1 ind., ZFMK (Qumsiyeh 1985); – Sakkara [14] (Flower 1932); Sakkara, tombs, 8 June 1951: inds. (Macy et al. 1961); Sakkara, caves, inds. (Heyneman & Macy 1962); Sakkara (Baruš 1973); Sakkara, (Madkour 1978); Sakkara, August 1965: 1 f, October 1965: 1 f, ASUC (Wassif et al. 1984); Saqqara, 11 inds., BMNH, FMNH, USNM (Qumsiyeh 1985); Tombs Saqqara (Sakkoura) Pyramids, 4 November 1963: 1 ind., YPM (Dornburg et al. 2011). – E l Q a h i r a h: Umgegend von Cairo [15], coll. inds. (Klunzinger 1878); Caire, 1 ind. (Looss 1896); Cairo, 1 m (Anderson 1902); Cairo (Flower 1932); Cairo Area (Hoogstraal 1952); Umgebung von Kairo, ZFMK (Kock 1969); Cairo, Sultan Mahmud Mosque, 21 April 1969: obs. a colony of some 50 inds., coll. 1 ma, 2 ms, 2 fs, IVB (Gaisler et al. 1972, Benda et al. 2006, Benda & Gaisler 2015); Cairo, Soltan Hassan Mosque, 14 September 1973: 1 ind., 1972–1975 (Saoud & Ramadan 1976a, 1977a, b, d); Cairo, Soltan Mahmoudy Mosque (Saoud & Ramadan 1976a); Cairo (Madkour 1978); neighbourhood of Cairo, inds. (Madkour et al. 1982); Old City of Cairo, coll. inds. (Ramadan 1986); El Cairo, 1 f, MNCN (Ibáñez & Fernández 1989); Cairo (Wassif 1995). – E l U q s u r: Ruins of Karnak [16], 23 March 1880: 8 ma, 8 fa, IMC (Anderson 1881, Ghosh 2008); Karnak, recesses of the ruins, numbers of inds. (Anderson 1902); Karnak, Big Temple, crevices between stone blocks, 26 April 1969: 2 ms, 4 fa, 1 fs, IVB, 1 May 1969: 1 f, IVB (Gaisler et al. 1972); Karnak, temple complex, April 1983: coll. 2 inds. from *Tyto alba* pellets (Goodman 1986); Karnak, Great Temple, 26 April & 1 May 1969: 4 m, 3 f, IVB (Benda et al. 2006, Benda & Gaisler 2015); – Nagaa El Sitayh [17], at a water channel, 11 January 2011: det. calls of 2 inds. (Benda et al. 2014a). – E l W a d i E l J a d i d: Dakhla Oasis, Bir El Wastani [18], ruins of a large house, 27 March 2011: obs. 2 inds. (Benda et al. 2014a); – Dakhla Oasis, Budkhula [19], abandoned house, 27 March 2011: obs. 1 ind. (Benda et al. 2014a); – Dakhla Oasis, Deir El Hagar [20], a crevice in a ruined village house, 30 March 2011: obs. 1 ind., 21 August 2011: obs. a colony (Benda et al. 2014a); Deir El Hagar, crevices in Roman ruins, 26 November 2010: obs. several inds., 30 March 2011: obs. 3 inds. (Benda et al. 2014a); – Dakhla Oasis, El Mozawaka [21], crevices in tombs ca. 5 km S of El Qasr, 26 November 2010: obs. 1+3 inds., 27 March 2011: obs. 1 ind. (Benda et al. 2014a); – Dakhla Oasis, El Qasr [22], above pools in the southern part of the village, 2 December 2010: det. calls of 1 ind. (Benda et al. 2014a); El Qasr, medina, 24 November 2010: det. calls of 1 ind. (Benda et al. 2014a); – Dakhla Oasis, [Er Rashda] [23], an abandoned house, 11 October 2011: obs. a colony of ca. 100 inds. (Lučan & Šálek 2013); Er Rashda, an abandoned house, 28 March 2011: obs. a small colony (6 inds.), 3 April 2011: obs. a colony of 12+ inds., 11 October 2011: obs. a colony of several tens of inds., 13 October 2011: net. 2 ma, 6 mj, 8 fa, NMP, 3 July 2012: obs. a colony of ca. 50 inds. (Benda et al. 2014a, Benda & Gaisler 2015); – Dakhla Oasis, Hindaw [24], fissures in a house wall, 20 August 2011: obs. a colony ca. 30 inds., exam. 1 ma (Benda et al. 2014a); – Dakhla Oasis, Ismant [25], medina, crevice in an abandoned house, 28 November 2010: obs. a group of ca. 5 inds., 11 October 2011: obs. 1 ind. (Benda et al. 2014a); – Dakhla Oasis, Mut [26], above a lake,

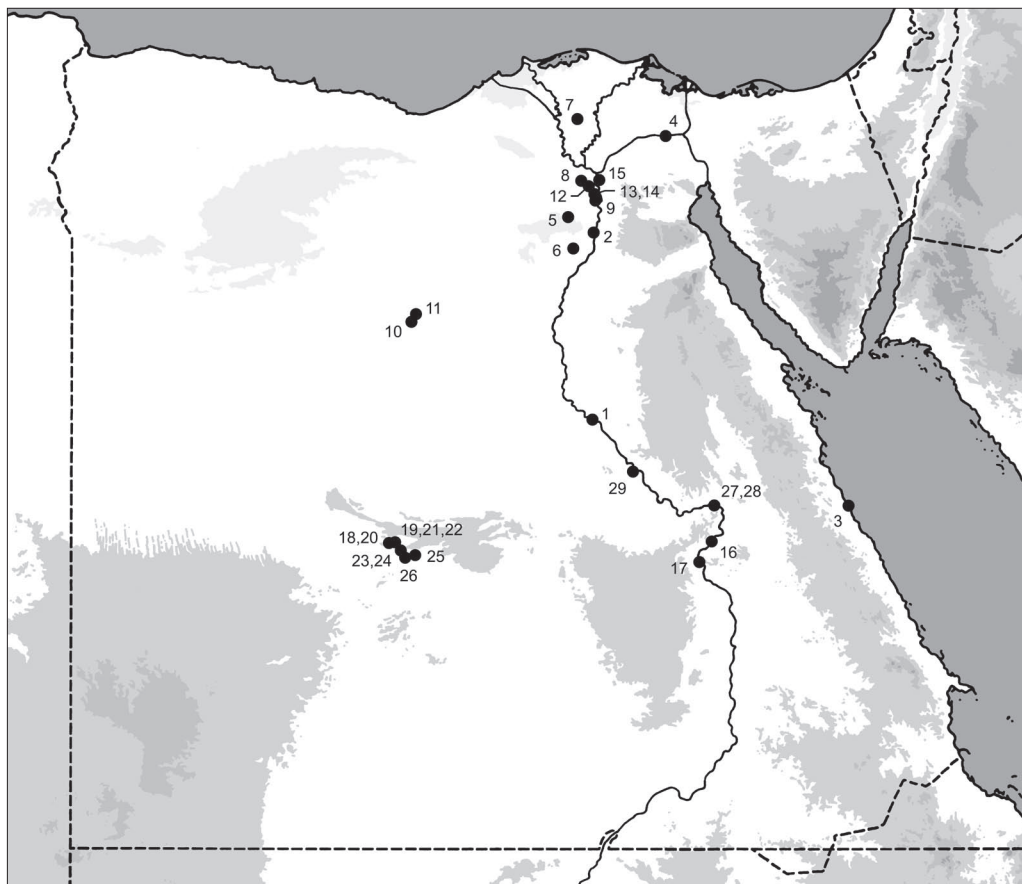


Fig. 16. Records of *Taphous nudiventris* Cretzschmar, 1830 in Egypt; for explanations see Fig. 3.

15 October 2011: det. calls of 1 foraging ind. (Benda et al. 2014a). – Q e n a: Dandara caves [27], coll. 25 inds. (Ammar 2018); – localities around Qena City [28], coll. 10 m, 8 f (Yaseen et al. 1994); Quena province, inds. (El Garhy 2003). – S o h a j: Sohag Province [29], deserted houses and caves, coll. 35 inds. (El-Damarany et al. 1997).

IMPRECISE RECORDS. Egypten (Cretzschmar 1830); Égypte (Lesson 1834); Egypte (Temminck 1838a [as *T. nudiventris*]); Egypten (Wagner 1840); Egypte (Temminck 1841 [as *T. nudiventris*]); Aegypten, 4 inds., SMF (Rüppell 1842b); Aegypten (Wagner 1855); Ägypten (Fitzinger & von Heuglin 1866); Aegypten (Hartmann 1868); Ägypten (Fitzinger 1870b); Egypt (Dobson 1875, 1876a); Egypten (von Heuglin 1877); Egypte (Trouessart 1879); Aegypten, 1 ind., KLHB (Nehring 1886); Egypte, 2 inds., RNHL (Jentink 1887, 1888); Aegypten, 1 m, ZMH (Noack 1891); Ägyptus (Trouessart 1897); Egypten (Palacký 1901); Ägyptus (Trouessart 1904); Egipto, 1 ind., MNCN (Cabrera 1912); Egypte (Gohar 1934); Egypt (Hoogstraal 1955, 1956); Ägypten (Möhres & Kulzer 1956b); Egypt, 11 inds. (Wells & Randall 1956); Ägypten, inds., SMF (Felten 1962); Egypt (Myers et al. 1962); Ägypten, 1910: 4 inds., ZFMK (von Lehmann 1964); Egypt, coll. inds. (El Sabban et al. 1967); Egypt (Madkour 1976b); Egypt, 1972–1975: 378 inds. (Saoud & Ramadan 1976b); A. R. Egypt, inds. (Madkour 1977c); Egypt, 1 ind., FMNH (DeBlase 1980); Egypt, 5 m, 9 f (Riad et al. 2000); Ägypten, before 1824: 2 inds., before 1831: 1 ind., SMF (Benda et al. 2006, Benda & Gaisler 2015). – Nubien (Cretzschmar 1830); Nubie (Lesson 1834); Nubia (Gray 1838 [as *T. nudiventris*]); Nubien (Temminck 1838a [as *T. nudiventris*]); Nubien (Wagner 1840); Nubie (Temminck 1841 [as *T. nudiventris*]); Nubia, 1 ind., BMNH (Gray 1843 [as *T. nudiventris*]); Nubie (Gervais

1854); Nubien (Wagner 1855, Hartmann 1863, 1868, Fitzinger & von Heuglin 1866, Fitzinger 1870b); Nubia (Dobson 1875, 1876a, 1878); Nubien (von Heuglin 1877); Nubie (Trouessart 1879); Nubie, 1 ind., RNHL (Jentink 1887); Nubia (Trouessart 1897); Nubien (Palacký 1901); Nubia (Senna 1905).

DISTRIBUTION. *Taphozous nudiventris* represents a medium-frequent bat species in Egypt, it has been documented from 29 localities (Fig. 16). It was found in all geographic regions of Egypt except the Mediterranean Sea shore and Sinai (Table 2). Most records of *T. nudiventris* were made in the Western Deserts, where this bat has been discovered only recently and where it was found to occupy just two oases (Benda et al. 2014a). A relatively high number of findings of *T. nudiventris* is available also from the Nile Valley, although the records are concentrated into two limited areas, to the northern part of the valley adjacent to the Cairo Region and to the central part of the Valley in Egypt between Assiut and Luxor Governorates, incl. (Fig. 16). The Egyptian records of *T. nudiventris* come from a very narrow range of lowland altitudes of 1–153 m a. s. l. (median 76.0 m, mean 76.7 m; Fig. 4, Table 3).

Since its description by Cretzschmar (1830) through the whole 19th century (see the review of records above), *T. nudiventris* was reported to occur in Nubia, although until recently, no particular record of this bat had been available* from the Nile Valley between the First and Sixth Cataracts nor from the surrounding areas or in the adjacent Red Sea shore. Perhaps all these references followed the simple mention by Cretzschmar (1830: 71), who gave as follows: “Vaterland. Egypten, Nubien. // Aufenthalt. Häufig in den Pyramiden von Gize.” This mention is based on the SMF series of specimens collected by Eduard Rüppell (1794–1884) in Egypt before 1824 and used by Cretzschmar (1830) for the original species description. One male specimen of this series was designated by Mertens (1925) as the lectotype of the species and only this specimen (SMF 4310) is labelled with an exact locality (“Gizeh-Pyramiden”), while the remaining two specimens (SMF 12080, 12082) are labelled just ‘Ägypten’ (Kock 1969, Benda et al. 2006). Although two additional old reports of specimens from Nubia are available (Gray 1843, Jentink 1887), both almost certainly refer to the material collected by E. Rüppell†. Rüppell (1829) did not describe the collection of the bats, neither from Egypt nor from Nubia. Thus, until an indisputable evidence of the Nubian origin of the Rüppell’s specimens is available or new findings of these bats are made in the field, *T. nudiventris* cannot be considered as a real part of the bat fauna of Egyptian Nubia.

The picture of the Egyptian distribution of *T. nudiventris* given by Qumsiyeh (1985) does not correspond well with the current view. This author did not mention any record from the Western Desert, where *T. nudiventris* has been recorded only during the recent decade (Lučan & Šálek 2013, Benda et al. 2014a); from the Nile Valley, Qumsiyeh (1985) reported only two localities of this bat, Karnak Temple in Luxor (Anderson 1881, 1902, Gaisler et al. 1972) and Lake Qarun in

* NOTE. Kock (1969: 86) commented on the reports of the Nubian occurrence of *Taphozous nudiventris* as follows: “Ich vermute, daß dieses Vorkommen nur nach Cretzschmar (1830) zitiert wird oder auf der gleichen Rüppell gesammelten Serie beruht. Aus Nubien sind keine genauen Nachweise bekannt geworden, und Material ist auch im SMF nicht vorhanden, so daß Belege also noch ausstehen. Zwischen der ägyptischen und den sudanesischen Populationen klafft anscheinend eine Verbreitungslücke von rund 1000 km Luftlinie!” However, in 2010 the occurrence of *T. nudiventris* in Nubia was confirmed and two localities situated between the Third and Fourth Cataracts in the Sudanese part of the Nile Valley were reported, Old Dongola and Jabal Barkal (Benda & Gaisler 2015, Uvizl et al. 2019).

† NOTE. In his catalogue of the BMNH collection of mammals, Gray (1843: 33) reported a specimen of *T. nudiventris* labelled “Nubia” with a note: “From the Leyden Museum” [= RNHL]. Later on, Jentink (1887: 287) mentioned a specimen described as “Squelette d’un individu semi-adulte. Nubie” in the catalogue of the RNHL collection of mammal osteology. In both cases, the reports refer to the RNHL specimens exchanged or purchased from the SMF collection in the 1830s to be available for the research by Temminck (1838a, 1841), who re-described this species under a new name *T. nudiventer* Temminck, 1838. Thus, the specimens originate from the SMF series of Rüppell’s specimens originally labelled to come from “Ägypten”.

the Faiyum depression (cf. Sanborn & Hoogstraal 1955). On the other hand, only from the Cairo Region, the number of sites known nowadays is identical with that known to Qumsiyeh (1985); also a majority of the geographically unspecified records of *T. nudiventris* most probably from Egypt originate from the latter region.

According to the current knowledge, the Egyptian occurrence area of *T. nudiventris* is isolated from the remaining segments of the distribution range of this bat, covering a broad area of semi-arid habitats in a longitudinal belt from West Africa to Indochina (Benda et al. 2006). The closest occurrence spot to the Egyptian range is situated in the east, in the central part of the Holy Land in the Dead Sea Basin (Mendelssohn & Yom-Tov 1999, Benda et al. 2010). In the south, the closest site of *T. nudiventris* is known from Jabal Barkal in the Nubian Nile Valley (Uvizl et al. 2019), other Sudanese records are localised along the Nile more to the south (Kock 1969, Koopman 1975). The geographical gap between the closest Egyptian and Sudanese localities of *T. nudiventris* occurrence is 780 km of latitudinal distance as the crow flies, and 1100 km along the Nile course. However, this species belongs to the rarest bat faunal elements in its African distribution range, namely in its Palaearctic part (Kock 1969, Happold 2013b); it is unknown in Libya and Tunisia (Puechmaillie et al. 2012, Benda et al. 2014b), and only few records are available from Morocco, Mauritania, and Algeria (see the review by Bendjeddou et al. 2020). Thus, the missing records of *T. nudiventris* from certain regions may not indicate its real absence there (the recent discovery of abundant presence of this bat in the Western Desert conforms with such a view). It is well possible that in Sinai, most parts of the Nile Valley including Egyptian Nubia, or in the Red Sea mountains this bat occurs and just remains undiscovered. On the other hand, in some regions *T. nudiventris* could be considered a common bat, namely in some Asian parts of its distribution range, like in Mesopotamia, western India, or in eastern Oman (Bates & Harrison 1997, Benda et al. 2006, own unpubl. data).

TAXONOMY. As mentioned above, *Taphozous nudiventris* as a species was first described by Cretzschmar (1830), based on the material collected by E. Rüppell from Egypt (Fig. 17); Cretzschmar (1830: 71) mentioned the ‘Pyramiden von Gize’ as the only specific site of the new species occurrence within ‘Egypten, Nubien’ and moreover, the lectotype specimen is labelled as originating from the ‘Gizeh-Pyramiden’ (Mertens 1925; see also comments in Distribution). Thus, ‘the Pyramids of Giza, Egypt’ [29°58’33”N, 31°07’52”E] or just ‘Giza, Egypt’ is generally accepted as the type locality of *T. nudiventris* (Flower 1932, Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Aellen 1957, Felten 1962, Harrison 1964, Kock 1969, Gaisler et al. 1972, Corbet 1978, Koopman 1975, 1993, Qumsiyeh 1985, 1996, Harrison & Bates 1991, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000, Simmons 2005, Benda et al. 2006, Happold 2013b, Lanza et al. 2015, Bonaccorso 2019, etc.). Perhaps only Setzer (1952) mentioned ‘Egypt’ as the type locality of this name.

The taxonomic affiliation of the Egyptian populations of *T. nudiventris* is clear; since the description of the species was made on the material from Egypt, all involved authors assign them to the nominotypical subspecies (Felten 1962, Hoogstraal 1962, Kock 1969, Gaisler et al. 1972, Corbet 1978, Qumsiyeh 1985, Koopman 1994, Benda et al. 2006, Happold 2013b, Uvizl et al. 2019). This subspecies is reported to differ from other subspecies of this species mainly by the small size of body and skull, and/or rather brownish colour of the pelage (Harrison 1964, Kock 1969, Benda et al. 2006). The distribution range of *T. n. nudiventris* was regarded for a long time to cover the whole species range in Africa and the western part of the Middle East (see e.g., Harrison & Bates 1991, Koopman 1994, Horáček et al. 2000, Benda et al. 2006, Happold 2013b, Bonaccorso 2019). The recent revision of the intraspecific variation in *T. nudiventris* based on the molecular genetic analysis (Uvizl et al. 2019) corroborated this view. However, this analysis



Fig. 17. An image of *Taphozous nudiventris* Cretzschmar, 1830 published as an illustration of the species description (Cretzschmar 1826–1830: Table 27).

found the lineage corresponding to the nominotypical subspecies also in the eastern part of the Arabian Peninsula, where a separate form was reported to occur, *T. n. zayidi* Harrison, 1955. The latter name was thus suggested to be considered a junior synonym of *T. n. nudiventris*, an opinion given already by Benda et al. (2006) based on morphological comparison.

Nycteris thebaica Geoffroy, 1813

RECORDS. **Published data:** A s w a n: Aswan [1] (Wassif 1995); Aswan, palm garden at the N edge of the town, 24 January 2010: net. 1 ma, NMP (Benda et al. 2014a); Aswan, tunnel under railway, 10 January 2011: net. 2 ma, 13 fa, NMP (Benda et al. 2014a); Aswan, 1 ind., NMP (Karmáčková 2017); – E d f ũ [2] (Hartmann 1868); – K o r o s k o [3], 1 f, MSNM (de Beaux 1923); Korosko, 1 ind., MSNG (Qumsiyeh 1985); – Q ô m - O m b ũ [4] (Hartmann 1868); – W â d i S i b a ' a [5] (Hartmann 1868). – B a n i S u e f: El Riyad [6], 15 March 1987: coll. 3 inds. from *Asio otus* pellets (Handwerk 1990). – E l B e h e i r a h: Beheira [7] (Sanborn & Hoogstraal 1955); Beheira (Hoogstraal 1962); Kom Hamada, 41 inds., FMNH, USNM (Qumsiyeh 1985); Kom Hamada, 5 inds., USNM (Van Cakenberghe & De Free 1998); – 12 mi W Wadi

El Natrun [8], 4 inds., USNM (Qumsiyeh 1985). – E l E s k e n d e r i y a h: Alexandrien [9], 17 January 1821: 1 ind. (Stresemann 1954). – E l F a y u m: Bahr el Roda [10], Sennures district, farm, a roost (Flower 1932); – Fayum Province [11] (Wassif & Hoogstraal 1954); Faiyum (Sanborn & Hoogstraal 1955); Faiyum (Hoogstraal 1962); Kom Oshim, 2 inds., USNM (Qumsiyeh 1985); El-Fayoum, coll. 3 f (El-Dawy & Ibrahim 1994); Komo Shim, 2 inds., USNM (Van Cakenberghe & De Free 1998); – near Lake Moeris (Birket Qarun) [12] in the Fayum, March 1909: 1 m (Bonhote 1909, Flower 1932); Lake Moeris, 13 March 1909: 1 m, BMNH (Nader & Kock 1983a); Lake Qarun, 1 ind., BMNH (Qumsiyeh 1985); Lake Moeris, 1 ind., BMNH (Van Cakenberghe & De Free 1998); – near Seila in the Fayum [13], 1–3 October 1923: over a dozen inds. (Flower 1932); Seila, 2 October 1923: 5 m, 3 f, BMNH (Nader & Kock 1983a); Seila, 8 inds., BMNH (Qumsiyeh 1985, Van Cakenberghe & De Free 1998). – E l J i z a h: Abu Rauwash [14], caves, inds. (Macy et al. 1961); Abu Rawash, caves, inds. (Heyneman & Macy 1962); Abu Rawash, coll. inds. (Madkour 1977b); Abu-Rawash, 1972–1975 (Saoud & Ramadan 1977a); Abu-Rawash, cave, 1 f (Saoud & Ramadan 1977c); Abu Rawash (Madkour 1978); Abu Rawash, 12 March 1951: 1 f, FMNH, 27 August 1954 & 1970: 1 f, 3 inds., HZM, IAN (Nader & Kock 1983a); Abu Rawash, April 1950: 3 f, May 1960: 1 f, 5 inds., January 1966: 7 m, 2 f, March 1967: 4 f, ASUC (Wassif et al. 1984); Abu Rawash, 33 inds., FMNH, HZM, USNM (Qumsiyeh 1985); Abu Rawash, 15 inds., HZM, USNM (Van Cakenberghe & De Free 1998); Abu-Rawash, March–October: coll. 20 fa (Mansour et al. 2006a, b); Abo Rawash, 2015–2016: 30 inds. (Ali et al. 2017); – Abu Sir [15], tombs and caves, 5 January 1953: inds. (Macy et al. 1961); Abu Sir, tombs and caves, inds.

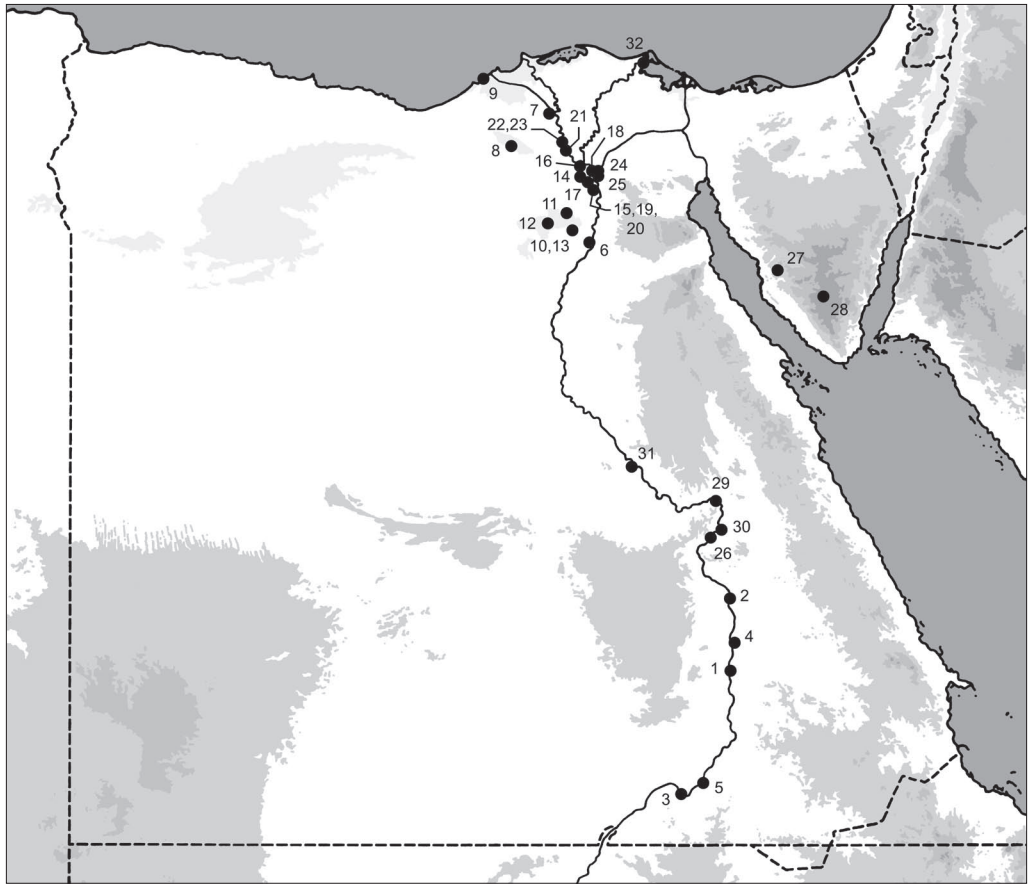


Fig. 18. Records of *Nycteris thebaica* Geoffroy, 1813 in Egypt; for explanations see Fig. 3.

(Heyneman & Macy 1962); – El Mansoria [16], inds. (Kandeil et al. 2020); – Gizeh [17], Zoological Gardens, August 1901: 1 f (Anderson 1902); Giza, January, May, July, August, September, October, November, obs. (Flower 1932); Giza Gardens, artificial grotto, 10 September 1908: 1 f (Flower 1932); Giza Province (Wassif & Hoogstraal 1954); Giza (Sanborn & Hoogstraal 1955); Giza, tombs and caves, inds. (Heyneman & Macy 1962); Giza (Hoogstraal 1962); Giza Pyramid, February 1942: 2 inds., ASUC (Wassif et al. 1984); Gizeh Zool. Garden, 1 August 1901 & 10 September 1908: 2 m, 2 f, BMNH (Nader & Kock 1983a); Giza, 7 inds., BMNH, SMNS (Qumsiyeh 1985); Giza Pyramids, 12 inds., FMNH (Qumsiyeh 1985); Giza Governorate, coll. inds. (Ramadan 1986); Giza province, 1987: 15 inds. (Kaaoud et al. 1989); Gizeh, 8 inds. BMNH (Van Cakenberghe & De Free 1998); Gizeh province, 2 inds., SMNS (Van Cakenberghe & De Free 1998); – Imbaba [18], Abu Rawash, 9 February 1960: 1 ind. (Radovsky & Yunker 1963, Radovsky 1967); Imbaba, Abu rawash, 9 February 1960: 1–2 inds. (Till & Evans 1964); Imbaba, April 1960: 1 m, ASUC (Wassif et al. 1984); – 20 km S von Kairo [19], 3 inds., SMF (Kock 1969); 20 km s. of Cairo, 1955: 3 ind., SMF (Nader & Kock 1983a); Cairo, 20 km S, 3 inds., SMF (Van Cakenberghe & De Free 1998); 20 km S Cairo, 3 inds., SMF (Kock et al. 2002); – Saqqara [20], 9 inds., SMF (Kock 1969); Saqqara s. of Cairo, 1 August 1963: 4 m, 2 f, SMF (Nader & Kock 1983a); Sakkara, 6 m, 8 f, December 1965: 1 f, January 1966: 1 f, January 1967: 2 m, 3 f, April 1967: 2 m, 8 f, September 1970: 1 m, 6 f, November 1975: 3 f, ASUC (Wassif et al. 1984); Saqqara, 19 inds., FMNH, USNM (Qumsiyeh 1985); Saqqara, 6 inds., SMF (Kock et al. 2002); Saqqara, 21 inds., SMF, USNM (Van Cakenberghe & De Free 1998); – Wardan [21], 26 inds., FMNH (Qumsiyeh 1985). – E l M o n u f i y a h: Kafr Dawud [22], 29 inds., FMNH, USNM (Qumsiyeh 1985); Kafr Dawud, 5 inds., USNM (Van Cakenberghe & De Free 1998); – Minufiya [23] (Sanborn & Hoogstraal 1955); Minufiya (Hoogstraal 1962); El Khatatba, 35 inds., FMNH (Qumsiyeh 1985). – E l Q a h i r a h: Bulak [24], March 1821 (Stresemann 1954); Bulac el Darkur, 29 October 1920: 1 ind., BMNH (Nader & Kock 1983a); Bulaq El Dakrur, 1 ind., BMNH (Qumsiyeh 1985); Bulaq, 1 ind., BMNH (Van Cakenberghe & De Free 1998); – Near Cairo [25], October 1902: 1 f (Anderson 1902); Cairo, 1 f, MSNM (de Beaux 1923); Cairo Area (Hoogstraal 1952); Kairo, 1 ind., SMF (Kock 1969); Cairo, 2 inds., 1946: 6 inds., ASUC (Wassif et al. 1984); Cairo, 1 ind., SMF (Nader & Kock 1983a); Cairo, 1 ind., USNM (Qumsiyeh 1985); Cairo, 2 inds., SMF, USNM (Van Cakenberghe & De Free 1998); Zokila, 4 inds., USNM (Van Cakenberghe & De Free 1998); Cairo, 1 m, SMF (Kock et al. 2002). – E l U q s u r: Theben [26] (Hartmann 1868); ruins of Karnak, 23 March 1880: 1 fa, IMC (Anderson 1881); Karnak, 3 m, 2 f (Anderson 1902); Thebes (Anderson 1902); El Karnak, Luxor, bat cave, inds. (Sonenshine et al. 1962 [as *Nycteris* sp.]); Karnak, Big Temple, 26 April 1969: obs. a colony of some 20 inds., coll. 2 fa, 1 May 1969: 1 fa, IVB (Gaisler et al. 1972); Luxor (Madkour 1978); Luxor, 2 inds., BMNH, NHMB (Qumsiyeh 1985); Luxor (Wassif 1995); Valley of the Kings, Al-Karnak, March 1983: 1 f, SMF (Kock et al. 2002); Karnak, 2 inds., BMNH (Van Cakenberghe & De Free 1998); Luxor, 1 ind., BMNH (Van Cakenberghe & De Free 1998); Thebe, 1 ind., BMNH (Van Cakenberghe & De Free 1998). – J a n u b S i n a i: Feiran Oasis [27], Wadi Feiran, garden el Braga, 11 August 2005: rec. sounds of 1 ind. of cf. *N. thebaica* (Dietz 2005b, Dietz & Maltby 2006); Feiran, El Braga Garden, 12 August 2005: det. & obs. 1 ind. (Benda et al. 2008); – Mt. Sinai [28], 1 f, BMNH (Harrison 1964); Mt. Sinai, 2 inds., BMNH (Qumsiyeh 1985); Mount Sinai, BMNH (Harrison & Bates 1991); Jabal Musa, 1 ind., BMNH (Van Cakenberghe & De Free 1998). – Q e n a: Denderah [29], 6 February 1860: obs. inds. (Hartmann 1863, 1868); Dandara, Temple of Hathor, 27 April 1969: obs. a colony of 80 inds., coll. 6 ma, 1 ms, 3 mj, 9 fa, 1 fs, 1 fj, IVB (Gaisler et al. 1972); Dandara, 27 April 1969: 1 ma, 1 fa, IVB (Gaisler & Baruš 1978); Dandara, 16 inds., MQC (Qumsiyeh 1985); – Khayzam [30], Luxor, 1 m (Anderson 1902); Khayzan, 1 ind., BMNH (Van Cakenberghe & De Free 1998). – S o h a j: Sohag Province [31], deserted houses and caves (El-Damarany et al. 1997).

IMPRECISE RECORDS. Aegypten (Oken 1816); Égypte (Lesson 1834); Egypt (Presl 1834); Egypt (Gray 1838); Egypten (Wagner 1840); Egypt, 1 ind., BMNH (Gray 1843); Égypte (Gervais 1854); Aegypten (Wagner 1855, Kolenati 1857a, 1858a); Ägypten (Kolenati 1859a); Aegypten (Peters 1871a); Egypt, 1 ind., BMNH (Dobson 1878, 1880); Égypte (Trouessart 1879); Aegypten, 1 ind., KLHB (Nehring 1886); Égypte, 4 inds., RNHL (Jentink 1888); Ægyptus (Trouessart 1897); Egypten (Palacký 1901); Ægyptus (Trouessart 1904); Egitto, 1 f, MSNG (de Beaux 1931); Egypt (Allen 1939); Égypte, 1 f(?)a, MNHN (Rode 1941); Egypt (Hoogstraal 1955, 1956); Ägypten (Möhres & Kulzer 1956b); Egypt, 15 inds. (Wells & Randall 1956); Egypt (Myers et al. 1962); Egypt, coll. inds. (El Sabban et al. 1967); Egypt, 15 inds. (Baruš 1973); Egypt (Madkour 1976b); Egypt, 1972–1975: 17 inds. (Saoud & Ramadan 1976b); A. R. Egypt, inds. (Madkour 1977c); Egypt, 18 inds., FMNH, USNM (Qumsiyeh 1985); Egypt, 11 inds., BMNH, MNHN, NMW, RNHL, SMF, SMND, ZFMK (Van Cakenberghe & De Free 1998); Egypt, 6 m, 8 f (Riad et al. 2000); Egypt, 2016–2017: 25 inds. (Kandeil et al. 2019). – Thébaïde (Geoffroy 1813a, 1818, 1828); Thébaïde (Desmarest 1820 [as *N. Geoffroyi*]); In Thébaïde Aegypti (Fischer 1829). – Mittel- und Ober-Ägypten, ziemlich häufig (Fitzinger & von Heuglin 1866); Oberägypten, Ruinen und Katakomben, großer Menge (von Heuglin 1877). – Upper Egypt, 1 ind., SMF (Nader & Kock 1983a, Kock et al. 2002). – Nubia, 2 inds., ZMB (Lichtenstein 1823); Nubien, 1 ind., SMF (Wagner 1840 [as *N. albiventer*]); Nubien (Kolenati 1859a, Hartmann 1863); Nubien (Fitzinger & von Heuglin 1866 [as *N. thebaica*, *N. albiventer*, and *N. discolor*]); Nubia (Allen 1939, Ellerman & Morrison-Scott 1951, 1966); Nubien, 1 ind., SMF (Kock 1969); Nubia, 1 ind., SMF (Kock et al. 2002). – im nördlichen Nubien (von Heuglin 1877 [as *N. discolor*]). – Sinaitic Peninsula (Anderson 1902); Sinai (De Beaux 1923). – Giza [14–21] and/or Damietta [32] Governorates, May–October 2016: net. 25 inds. (El Taweel et al. 2020). – vicinity of Cairo [24–25] and Giza [14–21] Province, October 1959–October 1961: 10 inds. (Mohammed & Saoud 1965).

DISTRIBUTION. *Nycteris thebaica* ranks among rather frequent bat species in Egypt, it has been found in 32 sites (Fig. 18). It was recorded in all geographic regions of Egypt except the Red Sea shore and mountains (Table 2). The prevailing numbers of localities of *N. thebaica* are concentrated to three geographic regions of Egypt, the Cairo Region, Nile Valley, and Nile Delta. In these regions, this species ranks among medium frequent bats, while in three other regions – the Mediterranean Sea shore, Western Desert, and Sinai – *N. thebaica* is a rare bat, known from one or two records only (Fig. 18).

The Egyptian records of *N. thebaica* are available from a wide altitude range of –42–1580 m a. s. l. (median 34.0 m, mean 115.6 m; Fig. 4, Table 3). However, the localities in the continental African part of Egypt lie in a very narrow range of lowland altitudes (–42–180 m a. s. l.; median 24.5 m, mean 48.3 m), while the two Sinaitic localities come from a very wide altitude range of 670–1580 m a. s. l. (median 1125.0 m, mean 1125.0 m; Fig. 5, Table 4). Thus, the continental and Sinaitic altitude ranges do not overlap and represent two separate distribution types in the lowland and mountainous zones.

The highest number of records of *N. thebaica* in Egypt, ca. two thirds of the whole amount, is available from the broader Nile Valley including the Cairo Region; most probably, also a majority of the geographically unspecified records of this bat made in Egypt originate from this area. In the Nile Valley, the records of *N. thebaica* are concentrated into two separate parts, to the Faiyum depression adjacent to the Cairo Region and to the southern half of the Egyptian section of the Valley between Dendera and Korosko (Fig. 18). The numerous unspecified reports of *N. thebaica* from Upper Egypt and northern Nubia also refer to the latter range segment (Fitzinger & von Heuglin 1866, von Heuglin 1877, Nader & Kock 1983a, Kock et al. 2002).

The current picture of distribution of *N. thebaica* in Egypt fully conforms to the view given by Qumsiyeh (1985), just the numbers of records have increased slightly in some regions. Van Cakenberghe & De Free (1998: 143) mentioned an Egyptian locality “Farniso near Cairo” with a reference to Thomas & Hinton (1921); however, the latter authors (p. 2) reported a record of *N. thebaica* from “Farniso, near Kano. 1,700 ft.” representing the Nigerian site of Fanisau [12°05’N, 08°32’E] in fact.

The occurrence of *N. thebaica* in Egypt represents one of its two distribution spots in Palaearctic Africa, this bat is almost completely absent from the Sahara per se (Bernard & Happold 2013b); in contrast to the limited occurrence area in western Morocco (Aulagnier et al. 2017) that is quite isolated and perhaps represents a distribution relic, the Egyptian range continues to other segments of the species distribution range (Van Cakenberghe & De Free 1998, Gray et al. 1999). In the south it directly extends to Sudanese Nubia where *N. thebaica* was recorded both in the Nile Valley and in the Red Sea mountains (Hartmann 1863, Fitzinger & von Heuglin 1866, Anderson 1902, Kock 1969) and this occurrence continues again to a wide range covering the whole savannah zone of sub-Saharan Africa (Bernard & Happold 2013b). Although the limited Sinaitic occurrence of this bat has not a direct continuity in the east, it represents a rather islet-like connection to the distribution in the Rift Valley of the Levant, where *N. thebaica* occurs in the whole length south of the Sea of Galilee Basin (Mendelssohn & Yom-Tov 1999, Benda et al. 2010); moreover, the gap between the record sites in Sinai and the Arava Valley covers only some 150 km.

TAXONOMY. *Nycteris thebaica* as a species was described from Egypt, Geoffroy (1813a: 20) named it originally as ‘Nyctère de la Thébaïde. *Nycteris Thebaicus*’ (Fig. 9). Oken (1816: 924) emended the species name to the grammatically correct variation, *N. thebaica*. The author of description did not report on the geographical origin of the type material, Geoffroy (1813a) just mentioned ‘Habite en Egypte’ concerning the new species, and Geoffroy (1818) reported only uncertainly this bat as the ‘espèce d’Égypte’ or ‘nyctère de la Thébaïde’, i.e., a bat from Egypt or from Thebais.

Since this rather vague description of the origin of the type specimen (moreover, being labelled just ‘Egypte’; see Rode 1941: 81; Van Cakenberghe & De Vree 1998: 148), most authors reported the type locality of *N. thebaica* as ‘Egypt’ (Flower 1932, Allen 1939, Ellerman & Morrison-Scott 1951, Ellerman et al. 1953, Sanborn & Hoogstraal 1955, Aellen 1957, Harrison 1964, Kock 1969, Gaisler et al. 1972, Atallah 1977, Corbet 1978, Harrison & Bates 1991, Van Cakenberghe & De Vree 1998, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000, Monadjem et al. 2020).

However, some authors tried to derive the type locality from the name *thebaica*; Gaisler et al. (1972: 15) were the first who argued in this direction, see as follows: “the name *thebaica* suggests [...] that the type material came directly from the area of the ancient Thebes”, although they did not try to restrict the type locality. This was suggested only by Koopman (1975: 379): “on the basis of the name, the type locality can safely be restricted to Thebes, near Luxor; according to Anderson [...], this species had been known, in Egypt, only from the vicinity of Thebes prior 1900”. Anderson (1902: 108) indeed noted as follows: “In Egypt proper it has hitherto only been recorded from Thebes and its neighbourhood.”, but this note does not give any evidence concerning the type material origin. Despite this, Qumsiyeh (1985: 29; 1996: 92) suggested that the type locality can be fixed to Thebes “as indicated by Anderson (1902)”. Finally, several authors accepted the suggestion by Koopman (1975) and mentioned the type locality of *N. thebaica* as ‘Thebes, Egypt’ (Koopman 1993, Simmons 2005, Lanza et al. 2015, Monadjem 2019b).

Lanza et al. (2015: 254) explained the derivation of the type locality name from the species name as follows: “From the feminine Latin adjective *thēbaica* [...] «native or belonging to Thebes», the ancient capital of Upper Egypt, on the site of modern Luxor, the type locality of the species”. However, as the original vernacular name suggests (Geoffroy 1813a, 1818, 1828, Desmarest 1820), the name *thebaicus* is not derived from the French word Thèbes, but from Thēbaïde (Thebais in Latin, from the Greek Θηβαῖς, and Thebais or Thebaid in English). The original meaning of the latter word is the name of a province of ancient Upper Egypt, named after its capital, Thebes. The geographical extent of Thebais changed during the history, the small (old) extent covered a part of the Nile Valley between Kom Ombo and Dendera, the large (young) extent included the Nile Valley section from Kom Ombo up to Asyut in the north, plus the Kharga Oasis in the west. The Geoffroy’s reference to this geographical area is the only indication of the type locality of *N. thebaica*.

Although it cannot be excluded that the type specimen/series really comes from Thebes, there is no evidence available to support this idea. On the other hand, the author indicates the origin of the type/s in a broadly defined locality situated in Upper Egypt. The largest extent of Thebais (Kom Ombo–Asyut) covers majority (ca. 62%) of the length of the Nile Valley in Upper Egypt (Aswan–El Ayat), and almost completely its southern part. Regarding the Geoffroy’s (1813a, 1818) rather vague indications, the type locality of *N. thebaica* thus could be restricted to ‘Upper Egypt’. Concerning the available evidence, such definition could be considered as justified.

Besides *N. thebaica*, the proper Egyptian and/or Nubian populations of the genus *Nycteris* Cuvier et Geoffroy, 1795 were affiliated to three other species names, *N. geoffroyi* Desmarest, 1820, *N. albiventer* Wagner, 1840, and *N. discolor* Wagner, 1840; all these names are currently considered junior synonyms of *N. thebaica* Geoffroy (see Van Cakenberghe & De Vree 1998, Simmons 2005). The latter two names were created by Wagner (1840: 439–440) to cover the colour polymorphism in this bat, while Desmarest (1820: 127) created the name *Nycteris Geoffroyi* as a new name for *N. thebaica* most probably to stress its more extensive distribution range that stretches out of Egypt to Senegal and thus the inopportune sense of the name *thebaica* indicating its occurrence only in Egypt (see the name change made for identical reasons by Temminck 1825 under *Rousettus aegyptiacus* above). Wagner (1840: 439) based the name *N. albiventer* on a specimen collected by Eduard Rüppell in Nubia and this name was mentioned from Nubia again by Fitzinger & von

Heuglin (1866). The latter authors plus von Heuglin (1877) reported additionally the name *N. discolor* from northern Nubia, this was, however, originally created for south-African populations (original type locality ‘Südspitze von Afrika’; Wagner 1840: 441). However, neither Fitzinger & von Heuglin (1866), Hartmann (1868), nor von Heuglin (1877) explained the use of these four names (*thebaica*, *geoffroyi*, *albiventer*, *discolor*) side by side (i.e., just in sympatry in most cases) in their lists of the fauna of north-eastern Africa. Anyway, a use of such name mixture was not followed by other authors, Peters (1871a) suggested to consider all these names synonyms of *N. thebaica*, except *N. discolor* that he regarded a synonym of *N. capensis* Smith, 1829 (currently also a synonym of *N. thebaica*, see Simmons 2005). The Peters’ (1871a) taxonomic arrangement of the *N. thebaica* group was accepted by subsequent authors (Dobson 1878, Trouessart 1879, 1897, Andersen 1912b, de Beaux 1923, Allen 1939).

The taxonomic affiliation of the Egyptian populations of *N. thebaica* is clear, since the description of the species was made on the material from Upper Egypt, all involved authors assign these populations – including those of Sinai and the Levant as well – to the nominotypical subspecies (Andersen 1912b, de Beaux 1923, Allen 1939, Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Hoogstraal 1962, Harrison 1964, Kock 1969, Gaisler et al. 1972, Koopman 1975, Atallah 1977, Qumsiyeh 1985, Harrison & Bates 1991, Koopman 1994, Horáček et al. 2000, Lanza et al. 2015). The intraspecific taxonomy, distinguishing up to eight subspecies in *N. thebaica*, is based mainly on the pelage colouration and body size differences. The nominotypical subspecies is reported to differ from other subspecies by the greyish brown pelage colouration and dark ears and wing membranes, and a relatively small size of body and skull, compared to the sub-Saharan populations, while a large size compared to the Arabian populations (Andersen 1912b, de Beaux 1923, Harrison 1964, Koopman 1975, Harrison & Bates 1991). The extent of the distribution range of *N. t. thebaica* varies among authors, most often it covers Egypt, northern Sudan, and northern Arabia including the Levant (Allen 1939, Ellerman & Morrison-Scott 1951, Hoogstraal 1962, Kock 1969, Koopman 1975, Atallah 1977), more recently also other parts of northern Africa, such as Chad, Morocco, and Senegal (Koopman 1994, Horáček et al. 2000, Lanza et al. 2015).

On the other hand, Van Cakenberghe & De Vree (1998), who evaluated colouration and metric characters of an extensive material covering the whole distribution range of *N. thebaica*, did not reveal any geographical trend in these two types of characters, and therefore, they did not distinguish any intraspecific taxa in this species. Similarly, Monadjem (2019b) tentatively regarded *N. thebaica* to be a monotypic species, since the taxonomic validity of the particular named forms remains in a need of revision.

Eptesicus bottae (Peters, 1869)

RECORDS. Published data: A s y u t: Assiut [1], non-inhabited caves, 70 inds. (El Naffar Laila et al. 1978 [as *Vespertilio innesi*]); – E l B a h r E l A h m a r: Ras Shukeir [2], near ponds in the sewage farm, 2009: det. calls (Anonymous 2011). – E l J i z a h: Abu Rawash [3], cave, August 1948: 1 m (Wassif 1962 [as *E. isabellinus*]); Abu Rawash, August 1948: 1 m, ASUC (Wassif et al. 1984 [as *E. innesi*]); – Abusir [4], tombs of Abusir South, coll. remains of 2 inds. (Pokorný et al. 2009). – E l M i n i y a: Eastern Desert, the ‘East Solar’ area [5], spring 2016: det. calls (Bergen et al. 2018). – E l Q a h i r a h: Caire [6], maisons, 1 m, MSNG, 1 f (Lataste 1887 [as *Vesperugo Innesi*]); Cairo, 1 m, 1 f (Anderson 1902 [as *Vespertilio innesi*]); Cairo, 1 m, MSNG, 1 f, BMNH (Thomas 1919 [as *E. innesi*]); Cairo, houses, ~1885: 1 m, MSNG, 1 f, BMNH (Flower 1932 [as *E. innesi*]); Cairo (Allen 1939 [as *E. innesi*]); Cairo, few inds. (Hoogstraal 1962 [as *E. isabellinus*]); Cairo, 1 m, 2 f, BMNH (Harrison 1963a [as *E. innesi*]); Cairo, 1 ind., BMNH (DeBlase 1980); Cairo, March 1891: 1 m, ZMH (Nader & Kock 1983b, cf. Noack 1891, Anderson 1902); Cairo, 2 inds., BMNH (Qumsiyeh 1985); Cairo, 1 m, BMNH (Hill & Harrison 1987); Cairo, 1 fa, BMNH (Benda et al. 2006). – J a n u b S i n a’: Ein Hodra Oasis [7], Wadi Hodra, 5 August 2005: obs. & rec. 1–3 inds. (Dietz 2005b, Dietz & Maltby 2006); Ain Hudra, oasis, 5 August 2005: det. & rec. 1–3 inds. (Benda et al. 2008); – Feiran Oasis [8], Wadi Feiran, garden el Braga, 10 August 2005: net. 1 ma, 11 August 2005: obs. & rec. 4 inds., 12 August 2005: obs. & rec. 2–4 inds. (Dietz 2005b, Dietz & Maltby 2006); Feiran,

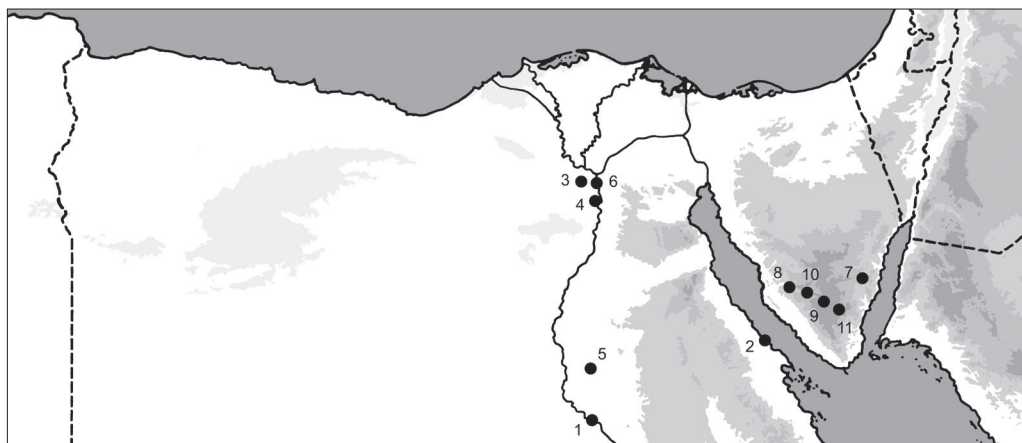


Fig. 19. Records of *Eptesicus bottae* (Peters, 1869) in Egypt; for explanations see Fig. 3.

El Braga Garden, 10 August 2005: net. 1 ma, CDIS, 11 August 2005: obs., det. & rec. 4 inds., 12 August 2005: det. & rec. 2–4 inds. (Benda et al. 2008, cf. Mayer et al. 2007); – Wadi Arbain [9], Saint Katherine Research Centre, 30 July 2005: obs. & rec. 2 inds., 2 August 2005: obs. & rec. 4 inds. (Dietz 2005b, Dietz & Maltby 2006); Fox Camp, Bedouin Garden, 3 July 2006: net. 1 ma (Dietz & Maltby 2006); El Milga, St. Katherine Research Centre, 30 July 2005: det. & rec. 2 inds., 2 August 2005: det. & rec. 4 inds. (Benda et al. 2008); El Milga, Fox Camp, olive grove in Bedouin garden, 3 July 2006: net. 1 ma (Benda et al. 2008); – Wadi El Braga camp [10], 10 July 2007: det. calls (Truscott 2007); Wadi Sulaf, Wadi El Braga Camp, 10 July 2007: det. & rec. min. 1 ind. (Benda et al. 2008); – Wadi Nasb [11], Awad's Garden, 28 June 2006: net. 1 ma (Dietz & Maltby 2006, Benda et al. 2008); Wadi Nasb, Mousa's Garden, 29 June 2006: net. 1 ma (Dietz & Maltby 2006, Benda et al. 2008); Wadi Nasb, animal pool, 27 July 2011: net. 1 ind. (Foui 2011).

IMPRECISE RECORDS. Aegypten, 1 m, ZMH (Noack 1891 [as *Vesperugo innesi*]); Ægyptus (Trouessart 1897 [as *Vesperugo innesi*]); Egypten (Palacký 1901 [as *Vesperugo innesi*]); Ægyptus (Trouessart 1904 [as *Vespertilio innesi*]). – Sinai (Corbet 1978).

DISTRIBUTION. *Eptesicus bottae* is an uncommon bat species in Egypt, it has been documented only from eleven sites (Fig. 19; Table 2). The findings come from three geographical regions in the north-eastern part of the country, but only in one of them the occurrence of this bat could be regarded as relatively abundant. The most numerous records are available from the southern part of the Sinaitic Peninsula, from five sites in the mountain habitats (Benda et al. 2008, Foui 2011). Six localities are known from the African part of Egypt (and from the whole Africa as well), three from anthropogenic habitats of the Cairo Region, one from the Nile Valley, one from the Eastern Desert, and one from the sea shore of the Gulf of Suez (Fig. 19; El Naffar Laila et al. 1978, Nader & Kock 1983b, Pokorný et al. 2009, Anonymous 2011, Bergen et al. 2018). The record from Assiut in the Nile Valley (El Naffar Laila et al. 1978) represents the southernmost known site of this bat in Africa.

The Egyptian records of *E. bottae* are available from a wide altitude range of 18–1590 m a. s. l. (median 472.5 m, mean 620.3 m; Fig. 4, Table 3). However, the localities in the continental African part of Egypt lie in a narrow range of lowland altitudes (18–275 m a. s. l.; median 51.0 m, mean 94.7 m), while the Sinaitic records come from a medium wide altitude range of 670–1590 m a. s. l. (median 1182.5 m, mean 1145.8; Fig. 5, Table 4). Thus, the continental and Sinaitic altitude ranges do not overlap and represent two separate distribution types in the lowland and mountainous zones.

The current view on the distribution of *E. bottae* in Egypt differs substantially from that presented by Qumsiyeh (1985). Until the 1980s, this bat was known only from two localities in the Cairo Region, Nader & Kock (1983b: 4) summarised all records of *E. bottae* from Egypt available at that time; these were based on six specimens collected at the end of the 19th and the first half of the 20th century, no new record of living *E. bottae* from Cairo Region was made since 1948. Three males and two females, including the lectotype and paralectotype specimens of *E. b. innesi* (Lataste, 1887) collected by Walter Innes Bey (1858–1937), were documented in Cairo in 1885–1903, one male was found in Abu Rawash in 1948 (Wassif 1962). Perhaps a colony (70 inds.) of *E. bottae* was found in Assiut in the 1970s (El Naffar Laila et al. 1978), while the remaining findings from Egypt have been made just recently, between 2005 and 2016 (Benda et al. 2008, Anonymous 2011, Foui 2011, Bergen et al. 2018). Osteological remains of two individuals of *E. bottae* were found in an Old Kingdom tomb at Abusir during excavations in 1995–2004 (Pokorný et al. 2009); however, the age of these remains is not clear, whether they come from the time of the tomb creation or from later periods. The occurrence of *E. bottae* in Sinai reported by Corbet (1978) is an apparent error not substantiated by a record, this author mistook Sinai for Negev in southern Israel, both being at that time parts of the latter country.

The Egyptian occurrence area of *E. bottae* represents the westernmost projection of the species distribution range, which covers the deserts and dry steppes of the Middle East, from Sinai and the southern Levant to Mesopotamia, southern Arabia and south-eastern Iran (Nader & Kock 1990a, Benda et al. 2006, Juste et al. 2013). The distribution spot in Sinai continues directly in the abundant occurrence of *E. bottae* in the southern part of the Holy Land (Dead Sea Basin and Arava/Araba Valley) and north-western Saudi Arabia (Mendelssohn & Yom-Tov 1999, Benda et al. 2010, Aloufi et al. 2016).

TAXONOMY. The Egyptian populations of *Eptesicus bottae* were originally reported as a separate species, *Vesperugo (Vesperus) Innesi*, described by Lataste (1887) on the basis of two specimens collected in Cairo by Walter Innes Bey in 1885 (see above). Lataste (1887: 628) described the circumstances of the collection of the type series as follows: “L’espèce nouvelle habite les maisons de la ville du Caire, en Égypte. Je suis heureux de la dédier à M. Walter Innes, conservateur du Musée de l’Ecole de Médecine de cette ville; car c’est à lui que je dois les deux sujets, ♂ et ♀, conservés dans l’alcool, qui ont servi à cette description, ainsi que beaucoup d’autres Mammifères et Reptiles égyptiens que j’ai utilisés ou que j’utiliserai de mon mieux au profit de la science. // Le sujet dont le crâne a été préparé, le mâle, a été offert par moi au Musée civique de Gênes; la femelle est conservée dans ma collection.” One of these type specimens, male, still remains housed in the MSNG collection in line with the statement by Lataste (1887) and was examined there by the senior author in 2009. The other type, female, originally kept in the private collection by Fernand Lataste (1847–1934), is currently housed in the BMNH collection. Thomas (1919: 350) designated the latter specimen as lectotype of *Vesperugo Innesi* (BMNH 19.7.7.3528.), the MSNG specimen thus became the paralectotype. After Thomas (1919), the lectotype was examined by numerous other authors (Flower 1932, Sanborn & Hoogstraal 1955, Harrison 1963a, 1964, DeBlase 1980, Qumsiyeh 1985, Benda et al. 2006).

Since Lataste (1887) clearly indicates the origin of the type series and the labelling of the specimens is in accordance with it (Cairo, Egypt, and Cairo, Egitto, respectively), the type locality of *Vesperugo Innesi* is universally mentioned correctly as ‘Cairo, Egypt’ [30°03’N, 31°15’E] (Anderson 1902, Thomas 1919, Flower 1932, Allen 1939, Ellerman & Morrison-Scott 1951, Setzer 1952, Sanborn & Hoogstraal 1955, Harrison 1963a, 1964, 1975, Atallah 1977, Corbet 1978, Nader & Kock 1983b, Qumsiyeh 1985, 1996, Harrison & Bates 1991, Benda et al. 2006, 2012b).

Taxonomic position of *Vesperugo Innesi* remained uncertain, since only two specimens deposited in two different collections were available for a long time (see e.g., Flower 1932, Setzer 1952). The name *innesi* was used as a species name in accordance with the description by Lataste (1887) until the 1950s, although under various combinations with the genus name, viz. *Vesperugo innesi* (Noack 1891, Trouessart 1897, Palacký 1901), *Vespertilio innesi* (Anderson 1902, Trouessart 1904, El Naffar Laila et al. 1978), and *Eptesicus innesi* (Thomas 1919, Flower 1932, Allen 1939, Setzer 1952, Harrison 1963a, Wassif et al. 1984). Ellerman & Morrison-Scott (1951) suggested to include this taxon as an Egyptian subspecies into the species rank of *Eptesicus isabellinus* (Temminck, 1840), besides two other subspecies, *E. i. isabellinus* from the ‘environs of Tripoli, Libya’, and *E. i. bottae* (Peters, 1869) from ‘Yemen, Arabia’. Although this view was apparently based just on original descriptions of these forms and not on a comparison of real material, it was accepted by several subsequent authors (Sanborn & Hoogstraal 1955, Hoogstraal 1962, Wassif 1962). Generally, this opinion really had a certain foundation, all three taxa are pale coloured desert forms of the genus *Eptesicus* Rafinesque, 1820, distributed in closely situated geographical ranges.

However, Harrison (1963a, b), who collected a new specimen of *innesi* from Israel and revised type specimens of all respective taxa, concluded to regard separate positions for *Eptesicus isabellinus* [suggested to be a subspecies of *E. serotinus* (Schreber, 1774)], and *E. innesi* referred back to a full species position. Shortly after this, Harrison (1964) modified this taxonomic arrangement, and suggested to include the form *innesi* into the species rank of *Eptesicus bottae*, at that time known only from the type specimen collected in Yemen*. Into the latter species rank, Harrison (1964) suggested to include also the populations of *E. hingstoni* Thomas, 1919 from Mesopotamia and *E. sodalis* Barret-Hamilton, 1910 from Europe (the latter name is currently considered invalid, being a synonym of *E. serotinus* (Schreber, 1774); see Simmons 2005). Although the species content of *E. bottae* slightly changed compared to the original conception by Harrison (1964) during the years, as some populations were excluded from its species rank and others were included (see Hanák & Gaisler 1971, Harrison 1975, Nader & Kock 1990a, Benda et al. 2006, Juste et al. 2013), the Egyptian populations, originally described as *Vesperugo Innesi* by Lataste (1887), were considered as the subspecies *E. bottae innesi* by almost all subsequent authors (Hanák & Gaisler 1971, Hayman & Hill 1971, Gaisler et al. 1972, Harrison 1975, Atallah 1977, Corbet 1978, DeBlase 1980, Nader & Kock 1983b, 1990a, Qumsiyeh 1985, 1996, Hill & Harrison 1987, Harrison & Bates 1991, Koopman 1994, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000, Simmons 2005, Benda et al. 2006, 2010, 2012b, Juste et al. 2013, Van Cakenberghe & Happold 2013a, Burgin 2019d). Only two exceptions occurred, El Naffar Laila et al. (1978), and Wassif et al. (1984) referred them to a separate species, as *Vespertilio innesi* and *Eptesicus innesi*, respectively. However, the use of these names most probably did not express a distinctive taxonomic opinion and represented just an error in the use of invalid names.

Benda et al. (2006) who examined and compared samples of all populations considered at that time to represent *E. bottae*, found only very fine differences between *E. b. innesi* and other

* NOTE. Peters (1869: 406) described *Vesperus Bottae* based on a specimen “stammt aus Arabien, wo es von Botta im Jahre 1837 gefangen wurde”, and the holotype specimen deposited in the MNHN collection remains labelled ‘Arabie’ (Rode 1941: 93; Benda et al. 2006: 309). Tate (1942) suggested to specify the type locality of *V. Bottae* to ‘Botta, Arabia’, while Ellerman & Morrison-Scott (1951) to ‘Yemen, Arabia’. Since the type specimen was collected by Paolo Emilio Botta (1802–1870) during his travel through Yemen that was described in his travel book (Botta 1841), Nader & Kock (1990a: 2) were able to restrict the type locality more precisely as follows: “as its collector journeyed in Yemen from Hodeida (Hudaydah) [...] to Hays, Ta’izz, back to Hays then to Al Mukha [...]”. This travel route restricts the terra typica to SW-Yemen”. Benda et al. (2006: 159) slightly simplified this expression to ‘southwestern Yemen, between Al Hudaydah, Ta’izz, and Al Mukha’. *E. bottae bottae* was known only from the holotype specimen until 1987 when three additional bats of this subspecies were collected at Misfera, south-western Saudi Arabia (Nader & Kock 1990a).

Arabian subspecies of *E. bottae*, namely *E. b. bottae* and *E. b. hingstoni*, making them only hardly distinguishable from each other. These results suggested that these desert-dwelling populations of *E. bottae* could represent even less taxa than three subspecies. On the other hand, the molecular genetic analysis by Juste et al. (2013) that followed the analysis of morphological data made by Benda et al. (2006), tentatively confirmed the justification of separate positions of *E. b. innesi* and *E. b. hingstoni*, although these two forms were shown to be the most closely related among all compared populations of *E. bottae*. However, the relationship between *E. b. innesi* and *E. b. bottae* still remains to be investigated using the genetic methods. From the biogeographical perspective – considering the relations between the Levantine and Yemeni populations found in other taxa – the consubspecificity of these two forms cannot be excluded. The justification of the separate taxonomic position of *E. bottae innesi* from Egypt thus remains to be proved.

Hypsugo ariel (Thomas, 1904)

RECORDS. Published data: A s w a n: El A'aqab [1], under a road bridge, 25 January 2010: net. 2 fa, NMP, det. calls of several inds. (Benda et al. 2011c, 2014a, 2016a, 2017); El Aqab, 2 inds., NMP (Karmáčková 2017). – E l B a h r: El A h m a r: eastern desert of Egypt, [2] near the Soudan frontier, about lat. 22° and long. 35°. Alt. 2000 feet, 12 August 1903: 1 f, 1 ind., BMNH (Thomas 1904); in or near the Wadi Alagi in the eastern Nubian desert, about 22° North latitude and about 35° East longitude, August 1903: 1 m, 1 f (Flower 1932); Near Wadi Alagi, 3 inds., BMNH (Koopman 1975); Wadi Alagi, 2 inds., BMNH (Qumsiyeh 1985); E Desert, 1 ind., BMNH (Hooper et al. 2006); E Desert of Egypt, 22°N, 35°E, 2000 ft, Wadi Alagi, 12 August 1903: 1 m, 1 f, BMNH (Benda et al. 2008, 2011c, 2017); – Ras Shukeir [3], near ponds in the sewage farm, 2009: det. calls (Anonymous 2011). – J a n u b S i n a': Ain El Furtaga [4], a canyon above the oasis, 15 September 2005: det. & rec. 1–2 inds. (Benda et al. 2008); – Ain Sudr [5], oasis, 18 September 2005: det. min. 1 ind. (Benda et al. 2008); – Ein Hodra [6], Wadi Hodra, 4 August 2005: obs. & rec. 2 inds., 5 August 2005: net. 1 ma, 1 fs, obs. & rec. 8 inds. (Dietz 2005b, Dietz & Maltby 2006 [as *Hypsugo* sp. & *H. bodenheimeri*]); Ein Hodra, 4 July 2006: net. 1 ma (Dietz & Maltby 2006); Ain Hodra Oasis, 3 July 2007: det. & obs. 3–4 inds. (Truscott 2007); Ain Hodra, oasis, 4 August 2005: net. 1 ma, 1 fs, CDIS, det. & rec. 4 inds., 5 August 2005: obs. det. & rec. 8 inds., 13 September 2005: det. & rec. 1–2 inds., 4 July 2006: net. 1 ma, 3–5 July 2007: det. & rec. min. 9 inds. (Benda et al. 2008, 2017, cf. Mayer et al. 2007, Veith et al. 2011); Ain Hudra, 4 August 2005: 1 m, CDIS (Benda et al. 2011c); – Feiran Oasis [7], Wadi Feiran, garden el Braga, 11 August 2005: obs. & rec. 3 inds., 12 August 2005: obs. & rec. 1 ind. (Dietz 2005b, Dietz & Maltby 2006 [as *Hypsugo* sp.]); Feiran, garden, 11 August 2005: obs., det. & rec. 3 inds., 12 August 2005: obs., det. & rec. 1 ind., 9 September 2005: det. & rec. min. 1 ind. (Benda et al. 2008); Feiran, above a pool, 8 September 2005: net. 1 m, 1 f, NMP, det. & rec. ca. 5 inds. (Benda et al. 2008, 2011c, 2017); – Saint Katherine Monastery [8], 2 inds., HUJ (Qumsiyeh 1985 [as *Pipistrellus bodenheimeri*]); Wadi Arbain, Saint Katherine Research Centre, 30 July 2005: obs. & rec. 2 inds., 9 August 2005: obs. & rec. 2 inds. (Dietz 2005b, Dietz & Maltby 2006 [as *Hypsugo* sp.]); Saint Katherine village, centre, 9 August 2005: obs. & rec. 1 ind. (Dietz 2005b, Dietz & Maltby 2006 [as *Hypsugo* sp.]); Saint Katherine monastery, at the entrance, 9 August 2005: obs. & rec. 1 ind. (Dietz 2005b, Dietz & Maltby 2006 [as *Hypsugo* sp.]); Wadi Arbain (Ramadan's garden), 1 August 2005: net. 1 ma (Dietz 2005b, Dietz & Maltby 2006); St. Katrina village & surroundings, at the St Katherine Protectorate Centre, 8 July 2007: det. & rec. calls (Truscott 2007); Rotog, small stony garden, 28 July 2007: det. calls (Truscott 2007); El Milga, Deir Sant Katerin, 9 August 2005: det. & rec. 1 ind., 8 July 2007: det. & rec. min. 1 ind. (Benda et al. 2008); El Milga, St. Katherine Research Centre, 30 July 2005: det. & rec. 2 inds., 9 August 2005: det. & rec. 2 inds. (Benda et al. 2008); El Milga, Rotog, 28 July 2007: det. & rec. min. 1 ind. (Benda et al. 2008); El Milga, village, 9 August 2005: det. & rec. 1 ind. (Benda et al. 2008); Wadi El Arbain, Ramadan's Garden, 1 August 2005: net. 1 ma, CDIS (Benda et al. 2008, 2011c, 2017, cf. Veith et al. 2011); – Sharm el-Sheikh airport [9], 24 August 2005: rec. 2 inds. (Dietz 2005b, Dietz & Maltby 2006 [as *Hypsugo* sp.]); Sharm El Sheikh, airport, 24 August 2005: det. & rec. 2 inds. (Benda et al. 2008); – Wadi El Braga camp [10], 10 July 2007: net. 1 fa, det. calls (Truscott 2007); Wadi Sulaf, Wadi El Braga Camp, 10 July 2007: net. 1 fa, det. & rec. min. 1 ind. (Benda et al. 2008); – Wadi Kharba [11], det. calls (Truscott 2007); Wadi Kharba, village, 12 July 2007: det. 1–2 foraging inds. (Benda et al. 2008); Wadi Gharaba, 12 July 2011: net. 1 ind. (Foui 2011); – Wadi Kid [12], garden, 18 July 2007: net. 3 fj, 19 July 2007: net. 1 ma (Truscott 2007, Benda et al. 2008); – Wadi Marra [13], 11 July 2006: net. 1 ma (Dietz & Maltby 2006, Benda et al. 2008); – Wadi Nasb [14], Awad's Garden, 22 July 2006: net. 1 fa (Dietz & Maltby 2006 [as *H. bodenheimeri*], Benda et al. 2008); Wadi Nasb, camp site, 26 July 2011: net. 5 inds. (Foui 2011); Wadi Nasb, animal pool, 27 July 2011: net. 7 inds. (Foui 2011); Wadi Nasb, village, 28 July 2011: net. 9 inds. (Foui 2011); – Wadi Sheikh awad [15], Ecolodge Al-Karm, 17 August 2005: obs. & rec. 15–20 inds., and 6 ind. close to the Ecolodge Al-Karm (Dietz 2005b, Dietz & Maltby 2006 [as *Hypsugo* sp.]); Sheik Awad, Mohammed's Garden, 19 July 2006: net. 1 fa (Dietz & Maltby 2006); Sheik Awad, outside Ecolodge, 19 July

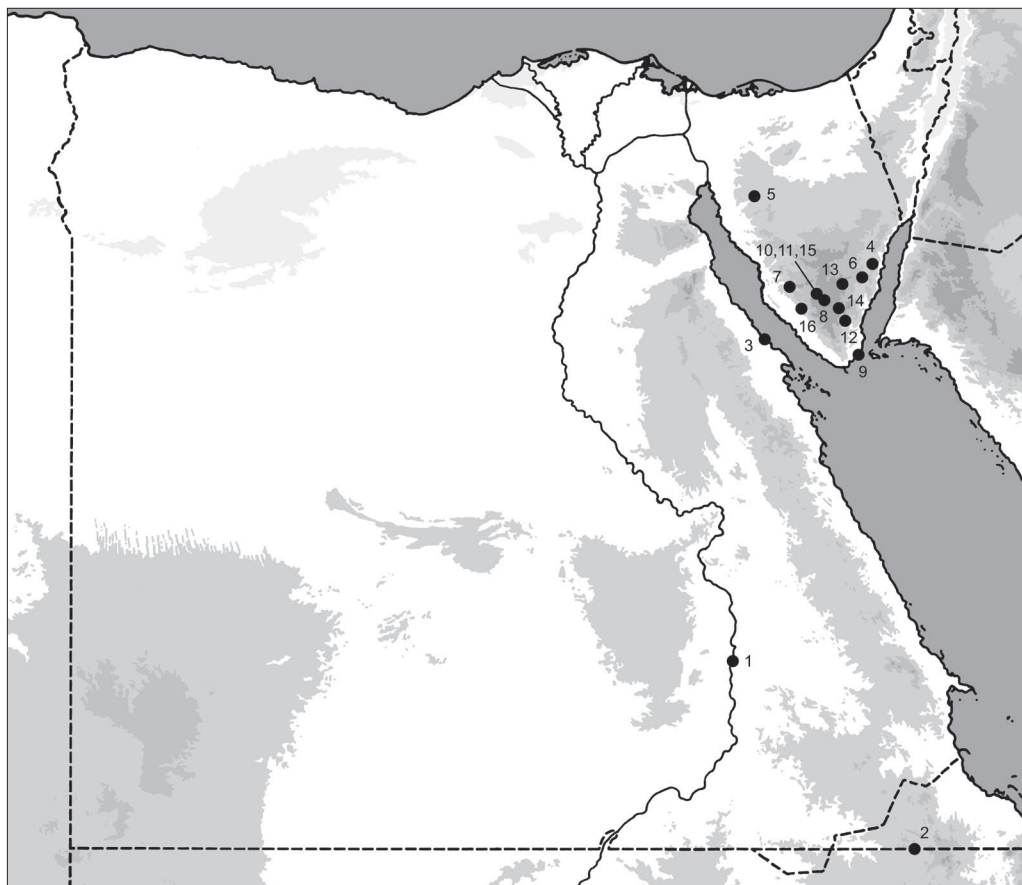


Fig. 20. Records of *Hypsugo ariel* (Thomas, 1904) in Egypt; for explanations see Fig. 3.

2006: net. 1 fs (Dietz & Maltby 2006); Sheikh Awad, Oder's Garden, 20 July 2006: net. 1 fa (Dietz & Maltby 2006 [as *H. bodenheimeri*]); Sheikh Awad, Awad garden, det. calls (Truscott 2007); Sheikh Awad, El Karm Ecolodge, 17–19 August 2005: obs., det. & rec. 15–20 inds., net. 1 fs (Benda et al. 2008); Sheikh Awad, Awad Garden, 11 July 2007: det. 1 ind. (Benda et al. 2008); Sheikh Awad, Mohammed's Garden, 19 July 2006: net. 1 fa (Benda et al. 2008); Sheikh Awad, Oder's Garden, 20 July 2006: net. 1 fa (Benda et al. 2008); – between Wadis Sulaf and Hebron [16], camp in a pass, 25 July 2007: det. calls (Truscott 2007); a village (name unknown) between the mountains and El Tor, 26 July 2007: det. calls (Truscott 2007); Wadi Hibran, a pass to Wadi Sulaf, 25 July 2007: det. & rec. min. 1 ind. (Benda et al. 2008); Wadi Hibran, Bedouin village, 26 July 2007: det. & rec. min. 1 ind. (Benda et al. 2008).

DISTRIBUTION. *Hypsugo ariel* represents a rather uncommon bat species in Egypt, it has been documented from 16 localities (Fig. 20; Table 2). The records are available from three geographical regions of the eastern part of the country; in the Nile Valley and the Red Sea mountains and shore only one and two findings of *H. ariel* are known, respectively, while in Sinai this bat could be regarded as very abundant. More than 80% of Egyptian records come from the latter region and this bat represents the second most frequent bat species there (Table 2). In the southern part of

Sinai, *H. ariel* was documented from 13 sites in a very wide altitude range of 59–1890 m a. s. l. (median 1042.5 m, mean 960.6 m; Fig. 5, Table 4; cf. Benda et al. 2008, Foui 2011). In the Nile Valley and Red Sea shore and mountains, the localities are situated in a rather narrow range of altitudes (18–510 m a. s. l.; median 96.0 m, mean 208.0 m).

Concerning Egypt as a whole, the records of *H. ariel* are available from a very wide altitude range of 18–1890 m a. s. l. (median 945.0 m, mean 886.3 m; Fig. 4, Table 3). Although the continental and Sinaitic altitude ranges largely overlap, they represent different distribution types; while *H. ariel* occurs in lowland and submontane altitudes in the continent, it lives mostly in mountains in Sinai.

For more than a century, *H. ariel* was reported only from the type series of two (Flower 1932, Qumsiyeh 1985, Benda et al. 2008) or three (Koopman 1975) bats collected by Arthur M. Mackilligin (dates not found) in August 1903 in Wadi El Allaqi in mountains of the Halaib Triangle, just on the border line between Egypt and the Sudan, that were used by Thomas (1904) for description of this species (see also Flower 1932: 383). Although Gaisler et al. (1972) assigned to this species a male specimen that was collected in Sayala (Nubia) in winter 1963–1964 and deposited in the NMW collection, this bat was re-identified as *Pipistrellus kuhlii* (under the name *P. deserti*) by Hill & Harrison (1987), based on the published description of the baculum from the respective bat (see Gaisler et al. 1972: 28). A possible record of *H. ariel* was also reported by Sanborn & Hoogstraal (1955: 117) who wrote as follows: “Hoogstraal and Kaiser believe they observed this bat [= *H. ariel*] at Bir Kansisrob, Gebel Elba, but were not able to secure specimens.” Although there are suitable habitats for *H. ariel* in the Gebel Elba mountains in the Halaib Triangle, such a report certainly does not represent a reliable evidence of this species.

Qumsiyeh (1985) published two specimens of *H. ariel* from Saint Katherine Monastery (= El Milga, Deir Sant Katerin) in Sinai that he found in the HUJ collection in Jerusalem; these bats were collected most probably during the Israeli occupation of the concerned part of Sinai in 1967–1979 (see Benda et al. 2008). However, since Qumsiyeh (1985) used the name *Pipistrellus bodenheimeri* Harrison, 1960, a synonym of *H. ariel* considered a separate species until 2008, for the respective specimens, *H. ariel* still remained known from Egypt only from its type locality.

Numerous additional findings of *H. ariel* in Egypt were made in the period 2005–2011, when many records were obtained from Sinai and two females were netted at a single site in the southern part of the Nile Valley (Fig. 20). This evidence suggest that *H. ariel* could be distributed rather widely in the arid areas of the Red Sea mountains of the whole eastern Egypt and only rarely it enters the lowlands in the Nile Valley or at the sea shore. The common occurrence in Sinai covers a variety of spots in a wide range of altitudes, representing mostly tiny villages or small gardens hidden deeply in desert valleys. Similar habitats are common in the whole length of the Red Sea mountains.

The Egyptian distribution of *H. ariel* continues to the east, in abundant occurrence in the deserts of the southern Holy Land (Yom-Tov et al. 1992, Mendelssohn & Yom-Tov 1999, Benda et al. 2010), from where the range is prolonged to the south, to western and southern Arabia up to western Oman (Harrison & Bates 1991, Gaucher & Harrison 1995, Benda et al. 2011c, Aloufi et al. 2016). In the African continent out of Egypt, only one record of *H. ariel* is available, Flower (1932) reported a collection of two specimens in a house at Rahad, Kordofan, Sudan [12°44'N, 30°38'E], in January 1927. This site lies more than a thousand kilometres south of the Egyptian state border.

TAXONOMY. The discovery of *Hypsugo ariel* was summarised by Flower (1932: 383) as follows: “This pale-coloured pygmy species of Pipistrel was made known to science by Oldfield Thomas from two specimens, a male and a female (the type) collected by A. M. Mackilligin in [12] August

1903 at an elevation of 2000 feet in or near the Wadi Alagi in the eastern Nubian desert, about 22° North latitude and about 35° East longitude, on the south (Sudan) side of the administrative boundary between Egypt and the Sudan. // The only other locality that I have heard of for this species is Rahad in Kordofan, about 600 miles south of the Egyptian frontier [...]” Flower (1932) here described in detail data on the type series as well as the type locality of this species first presented by Thomas (1904). While Flower (1932) suggested to place the type locality to the Nubian desert of the Sudan, Thomas (1904: 155) originally reported the collection to be made “in the eastern desert of Egypt, near the Soudan frontier”. Since the reported parallel of latitude (22°N) represents just the border line between the Sudan and Egypt, the locality could be regarded as a part of both countries. (To be correct, the Halaib Triangle, in the southern border of which the type locality is positioned (see Fig. 20), is a disputed area claimed by both countries, currently occupied and administered by Egypt.) Thus, the type locality is almost equally reported to be situated in Egypt (Ellerman & Morrison-Scott 1951, Hoogstraal 1962, Kock 1969, Gaisler et al. 1972, Corbet 1978, Qumsiyeh 1985, 1996, Koopman 1994, Benda et al. 2008) or in the Sudan (Flower 1932, Koopman 1975, Harrison & Bates 1991, Mendelssohn & Yom-Tov 1999, Simmons 2005, Van Cakenberghe & Happold 2013b, Burgin 2019c), and some authors mentioned both countries (Sanborn & Hoogstraal 1955, Koopman 1993, Horáček et al. 2000).

The two BMNH specimens enumerated by Flower (1932) remained the only known representatives of the species until almost recently, and the species was thus regarded to be an exclusively African bat in several compendia (Ellerman & Morrison-Scott 1951, Hayman & Hill 1971, Corbet 1978, Koopman 1993, 1994). Only in 1987, sixty years after the last specimen from the Sudan, *H. ariel* was newly found in the Dead Sea Basin of Israel (Makin & Harrison 1988). However, some authors suggested possible conspecific relations of *H. ariel* to another species of the Middle East, *H. bodenheimeri* (Harrison, 1960), known to occur in the Holy Land, Sinai, Saudi Arabia, and Yemen (Yom-Tov et al. 1992, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000, Simmons 2005). By a series of authors (Makin & Harrison 1988, Harrison & Bates 1991, Koopman 1994), *H. ariel* was reported to share most of morphological traits with *H. bodenheimeri* (body size, colouration, skull characters, most of dental characters, baculum size and shape), except for the structure of the first upper incisor (I²). In *H. ariel*, this tooth was reported to be unicuspidal while bicuspidal in *H. bodenheimeri*. However, Benda et al. (2008), examining a large series of specimens from the whole distribution range (Egypt/Sudan, Sinai, Israel, Jordan, Yemen), demonstrated these two states of the upper incisor structure to be just extreme variations of a continuum of several intermediate states. Since the only character considered reliable for separation of these species was doubted, these authors suggested to consider both taxon names as synonyms, *H. ariel* having a priority over *H. bodenheimeri*. This opinion was corroborated with the results of a molecular genetic analysis by Benda et al. (2016a), which showed the Yemeni and Egyptian samples of *H. ariel* to represent a single lineage of a mitochondrial gene.

Two bats affiliated to *H. bodenheimeri* (under an older taxonomic conception within the genus *Pipistrellus* Kaup, 1829) were reported by Qumsiyeh (1985) from Saint Katherine Monastery, Sinai, Egypt. Thus, under the current taxonomic arrangement this record represents the first evidence of *H. ariel* from Sinai. Currently, *H. ariel* is considered a monotypic species (Burgin 2019c), distributed in areas broadly adjacent to the African and Arabian coastline of the Red Sea (see Distribution above).

Pipistrellus kuhlii (Kuhl, 1817)

RECORDS. **Published data:** A s y u t: Qâou el-Koubara [1], dans des interstices de colonnes (Geoffroy 1818, 1828 [as *Vespertilio pipistrellus*]); Qiâou-el Koubara, interstices de colonnes (Desmarest 1820 [as *Vespertilio pipistrellus*]); – Rifa

village [2] and other villages near Assiut city [3], coll. inds. (Fahmy et al. 1978). – A s w a n: Aswan [4], 2 inds., BMNH (Qumsiyeh 1985 [as *P. aegyptius*]); Aswan, palm garden at the N edge of the town, 24 January 2010: det. calls of several inds. (Benda et al. 2014a); – S a y a l a [5], Upper Egypt, winter 1963/1964: 1 m, NMW (Gaisler et al. 1972 [as *Pipistrellus ariel*]); Upper Egypt, 1 m, NMW (Hill & Harrison 1987 [as *P. deserti*]). – B a n i S u e f: El Riyad [6], 19 June 1987: 1 ind. from owl pellets, 3 September 1987: 4 inds. from owl pellets, 1 December 1988: coll. 1 ind. from *Asio otus* pellets (Handwerk 1990). – E d D a q a h l i y a h: Sherbin [7], 1 ind., BMNH (Qumsiyeh 1985); – 5 miles west of Simbillawe-in [8], 1 m, 5 f, USNM (Setzer 1952); 5 miles west of Simbillawe-in, 26 February 1947: 1 ind. (Smit 1953); Dakhla Dist., 26 February 1947: 1 ind. (Theodor & Moscona 1954); at Simbillawe-in, 1951: 1 ind. (Keegan 1956); Simbillawe-in, Dakhila Prov. (Theodor 1956); Simbillawe-in, 24 February 1947: 1 ind. (Hubbard 1960); 5 miles west of Simbillawe-in (12 miles S.S.E. of Mansura), 26 February 1947: 1 ind. (Hopkins & Rothschild 1956); Tanboul, 8 km W of Simbillawe-in, 26 February 1947: net. 7 inds. (Haas & Tomich 1973); 5 mi W Simbillawe-in, 7 inds., MVZ, USNM (Qumsiyeh 1985); 8 km W Simbillawe-in, 26 November 1947: 1 ind. (Lewis 2006). – E l B a h r E l A h m a r: Ras Shukeir [9], near ponds in the sewage farm, 2009: det. calls (Anonymous 2011). – E l B e h e r a h: Idfina [10], barns of King's Estates, 16 July 1952: inds. (Macy et al. 1961); Idfina, barns, inds. (Heyneman & Macy 1962); Idfina, 16 July 1952: inds. (Radovsky 1967); Beheira Governorate, coll. inds. (Eissa & Yassin 2015 [as *P. deserti*]); – Kom Hamada [11], 1 ind., FMNH (Qumsiyeh 1985); – Wadi Natron [12] (Flower 1932); Wadi El Natrun, 1 ind., BMNH (Qumsiyeh 1985). – E l E s k e n d e r i y a h: Bahig [13], W von Alexandrien, 16 August, 1 ind., SMF (Kock 1969); Bahig, W Alexandria, 1 ind., SMF (Kock et al. 1972); Bahig, Western Desert, 16 August 1965: 1 ma, SMF (Benda et al. 2004c, 2006, 2014b, 2015); – Bourg El-Arab [14], rest-house, May 1950: coll. 1 m (Wassif 1953); Burgh-el-Arab, small cave, 14 May 1969: 1 m, IVB (Gaisler et al. 1972, Benda et al. 2004c, 2006, 2014b, 2015); Burgh-El-Arab 40 km west of Alexandria (Madkour 1978); Burg El-Arab, 1 f, July 1959: 1 f, September 1979: 2 f, ASUC (Wassif et al. 1984); – Ramlah [15] (Anderson 1902); Ramlah, 1 ind., BMNH (Qumsiyeh 1985). – E l E s m a ' i l i y a h: Ismailia Governorate [16], coll. inds. (Eissa & Yassin 2015 [as *P. deserti*]). – E l F a y u m: El Lahun [17], 2 inds., FMNH (Qumsiyeh 1985); – Fayum [18], 1 m (Anderson 1902); Fayum (Bonhote 1909); Faiyum (Sanborn & Hoogstraal 1955); Faiyum (Hoogstraal 1962); El-Faiyum, July 1968: 1 f, ASUC (Wassif et al. 1984); Fayoum governorate, 7 inds. (Aboelnour et al. 2020); Fayum District, April–July 2018: 9 inds. (Massoud & Abumandour 2020); – Kasr Karoon [19], coll. 20 inds. (Morsy et al. 1986a, b); – Lake Qarun [20], 1 ind., BMNH (Qumsiyeh 1985); – Sinnuris [21], Fayum, 7 July 1953 (Usinger 1960, 1966). – E l G h a r b i y a h: Gharbia Governorate [22], coll. inds. (Eissa & Yassin 2015 [as *P. deserti*]). – E l J i z a h: Abu Ghalib [23], 22 inds., MQC (Qumsiyeh 1985); – Abu Rawash [24] near Giza, unoccupied house, crevices between ceiling and the roof, 19 April 1969: 2 ma, IVB (Gaisler et al. 1972, Benda et al. 2004c, 2006, 2014b, 2015); Abu Rawash (Madkour 1978); Abu Rawwash, coll. 10 inds. (Saoud & Ramadan 1982); Abu Rawash, 2 f, 42 inds., July 1942: 1 ind., April 1944: 1 m, 1 f, November 1948: 1 m, June 1952: 4 m, 11 f, September 1953: 2 f, December 1955: 4 m, 1 f, February 1957: 3 m, November 1959: 1 m, February 1963: 4 f, December 1965: 2 m, 10 f, January 1966: 1 f, February 1966: 16 m, 43 f, March 1966: 3 m, 12 f, April 1966: 24 m, 1 f, May 1966: 2 m, 1 f, December 1966: 16 m, 39 f, January 1967: 7 m, 4 f, February 1967: 5 m, 6 f, March 1967: 1 f, April 1967: 2 m, November 1967: 4 f, June 1969: 3 m, 13 f, March 1974: 1 ind., ASUC (Wassif et al. 1984); Abu Rawash, 58 inds., FMNH, USNM (Qumsiyeh 1985); Abu-Rawash, 8 inds. (Farid & Lotfy 2001 [as *Vespertilio*]); Abu-Rawash, coll. inds. (Selim et al. 2008); Abo Rawash, 2015–2016: 28 inds. (Ali et al. 2017 [as *P. deserti*]); – Abusir [25], tombs of Abusir South, 17 inds. (Pokorný et al. 2009); – Bahariya Oasis, Bawiti [26], palm orchard, 18 January 2010: det. calls of 2–3 inds., 19 November 2010: net. 22 inds., 30 December 2010: det. calls of ca. 5 foraging inds., net. 1 ma, 1 fs, NMP, 4 March 2012: exam. 3 fs (Benda et al. 2014a, b); Bawiti, above an irrigation channel in a palm orchard, 18 January 2010: net. 1 ma, NMP, det. calls of min. 2 inds. (Benda et al. 2014a, b, 2015); Bawiti, village, 16 October 2011: det. calls of tens of inds., net. 4 ma, 1 fa (Benda et al. 2014a); Bahariya Oasis, 1 ind., NMP (Karmáčková 2017); – Bahariya Oasis, Bawiti [27], small mosque at a lake, 4 March 2012: obs. 3+1 inds. roosting in roof fissures, exam. 1 ma, 2 fs (Benda et al. 2014a); – Birqash [28], inds. (Kandeil et al. 2020); – El Aiyat [29], 16 inds., USNM (Qumsiyeh 1985); – El Mansoria [30], inds. (Kandeil et al. 2020); – 4 km W. of El Mansuriya [31], 28 May 1951: inds. (Usinger 1960, 1966); 4 km W El Mansuriya, 32 inds., FMNH (Qumsiyeh 1985); – Western Desert (West of El Mansuriya) (Sanborn & Hoogstraal 1955); 25 km. west of El Mansuriya [32], 1 ind. (Keegan 1956); – El Qatta [33], 2 inds., FMNH (Qumsiyeh 1985); – Gizeh [34], 2 m, 2 f (Anderson 1902); near Giza (Bonhote 1909); Giza Gardens, a hole in an old wall, 28 January 1905: 5 inds. (Flower 1932); Giza (Sanborn & Hoogstraal 1955); Giza (Hoogstraal 1962); Giza, 37 inds., BMNH, MCZ, USNM (Qumsiyeh 1985); Egypt [= El Jizah], fall 2012: coll. 50 inds. (Greiman et al. 2017); – Imbaba [35], Abu Rawash, 24 September 1951, 21 October 1953, 19 August & 25 September 1959: inds. (Usinger 1960, 1966); Imbaba, Abu Rawash, 25 September 1959: 1 ind. (Coetzee & Segermann 1992 [as *Pipistrellus* sp.]); – Sakkarah [36], December 1965: 1 f, March 1966: 1 m, 6 f, ASUC (Wassif et al. 1984); Saqqara, 1 ind., MQC (Qumsiyeh 1985). – E l M i n i y a: Minia [37], 1 m (Anderson 1902); – Tel el Amarna [38], 1 m (Anderson 1902); Tel El Amarnah, 1 ind., BMNH (Qumsiyeh 1985). – E l M o n u f i y a h: Minufiya [39] (Hoogstraal 1962). – E l Q a h i r a h: Cairo [40], 2 m, 3 f (Anderson 1902); Cairo, 1 ind. (Looss 1907); Kairo, 1 ind., NHMB (Engelmann 1912); La Caire (Gohar 1934); Cairo Area (Hoogstraal 1952, 1962); Cairo, September 1953: 1 f, ASUC (Wassif et al. 1984); Cairo, 6 inds., BMNH, NHMB (Qumsiyeh 1985); Cairo, 1 ind., ZMB (Hartwich & Kilias 1990); El Qahirah, Muqattam, old quarries, 29 January 2010: obs.

a group of ca. 5 inds., coll. 2 ma, NMP, 30 January 2010: net. 3 ma, 17 November 2010: obs. a group of 4 inds., exam. 1 ma (Benda et al. 2014a, b); Cairo, 29 January 2010: 2 ma, NMP (Benda et al. 2014b, 2015); Cairo, 2 inds., NMP (Karmáčková 2017); – El Qahirah [41], Zamalek Island, 29 January 2010: det. calls of several inds., 22 March 2011: obs. & det. calls of 1 ind. (Benda et al. 2014a); – Maadi [42], 1 ind., USNM (Setzer 1952); El Maadi, 3 inds., FMNH, USNM (Qumsiyeh 1985); – Mataria [43], June 1947: 1 m, ASUC (Wassif et al. 1984). – E l Q a l y u b i y a h: Qaliobia Governorate [44], coll. inds. (Eissa & Yassin 2015 [as *P. deserti*]). – E l U q s u r: Nagaa El Sitayh [45], at a water channel, 11 January 2011: det. calls of 1 ind. (Benda et al. 2014a); – Thèbes [46], plusieurs individus (Geoffroy 1818, 1828 [as *Vespertilio pipistrellus*]); Thèbes, dans les catacombes (Desmarest 1820 [as *Vespertilio pipistrellus*]); in cryptis Thebarum Aegypti (Fischer 1829 [as *Vespertilio pipistrellus*]); Theben, in den unterirdischen Gewölben (Fitzinger 1870d [as *Vesperugo Ursula*]); Theben (von Heuglin 1877 [as *Vesperugo pipistrellus*]); Luxor, 1 f (Anderson 1902); Luxor, garden of the Luxor Hotel, 26 April 1969: 2 f, 27 April 1969: 1 m, 3 f, 28 April 1969: 2 f, 29 April 1969: 3 f, 1 May 1969: 4 f, 3 May 1969: 1 f, IVB (Gaisler et al. 1972 [as *P. deserti*]); Luxor, 4 inds., BMNH, FMNH (Qumsiyeh 1985 [as *P. aegyptius*]); Luxor, hotel garden, 26–29 April 1969, 1 May 1969: 1 m, 15 f, IVB (Benda et al. 2004c [as *P. deserti*], 2014b, 2015); El Uqsar (Thebes), on the Nile bank, 26 January 2010: det. calls of several inds., 27 January 2010: det. calls of 1 ind. (Benda et al. 2014a). – E l W a d i E l J a d i d: Dakhla Oasis, Balat [47], medina, crevice in wall of a house, 25 November 2010: obs. 1 ind., 22 August 2011: obs. a small colony (Benda et al. 2014a); – Dakhla [Oasis], Bashendi [48], 23 January 2010: 1 ind. (Quetglas et al. 2012); Dakhla Oasis, Bashindi, in crevices of the Tomb of Pasha Hindi, 23 January 2010: obs. 3 inds., coll. 1 m, 1 f, NMP (Benda et al. 2014a, b); – Dakhla Oasis, Bir El Wastani [49], ruins, 9 October 2011: obs. a colony of ca. 10 inds., exam. 2 fa, 3 fj (Benda et al. 2014a); – Dakhla Oasis, Budukhla [50], in the streets of village, 3 December 2010: det. calls of ca. 5 inds. (Benda et al. 2014a); Budkhula, abandoned house, 21 August 2011: obs. a colony of 14 inds. in a beam fissure (Benda et al. 2014a); – Dakhla Oasis, El Gharghour [51], at a small pond, 27 November 2010: det. calls of several inds. (Benda et al. 2014a); Gedida, village, 26 November 2010: det. calls of several inds. (Benda et al. 2014a); Gedida, tomb, 28 February 2012: obs. a group of min. 3 inds. (Benda et al. 2014a); – Dakhla Oasis, El Qasr [52], medina, 21 January 2010: net. 2 ma, NMP, 24 November 2010: det. calls of several tens of inds., 25 November 2010: net. 2 ma, 2 ms, 1 fs, 5 January 2011: obs. & det. calls of ca. 20 inds. (Benda et al. 2014a, b, 2015); El Qasr, medina, abandoned house, 26 November 2010: obs. 3 inds. in a beam fissure, 27 November 2010: obs. 1 ind. in a beam fissure, 2 December 2010: obs. 1 ind. in a wall fissure, 27 March 2011: obs. a colony of 9 inds. in a beam fissure, 22 August 2011: obs. a colony of ca. 15 inds. in a beam fissure, 28 February 2012: obs. 4 inds., 2 March 2012: obs. a colony of ca. 20 inds. (Benda et al. 2014a); El Qasr, medina, Nasr El Din mosque, 29 March – 8 April 2011 (one check per day): obs. a colony of 3–46 inds., 2 March 2012: obs. 1 ind. (Benda et al. 2014a); El Qasr, above a pool at medina, 21 January 2010: net. 2 ma, NMP, 22 January 2010: net. 1 ma, NMP, det. calls of numerous foraging inds., 25 March 2011: net. 1 ma, obs. & det. calls of ca. 5 inds. (Benda et al. 2014a, b, 2015); El Qasr, pools in the southern part of the oasis, 2 December 2010: det. calls of tens of foraging inds. (Benda et al. 2014a); El Qasr, palm orchard, 21 November 2010: net. 1 ma, 23 November 2010: net. 2 ma, 4 July 2012: det. calls of 1 ind. (Benda et al. 2014a); El Qasr, stands of eucalyptus trees, 2 December 2010: det. calls of tens of inds., 28 March 2011: det. calls of ca. 5 inds. (Benda et al. 2014a); Dakhla Oasis, 7 inds., NMP (Karmáčková 2017); – Dakhla Oasis, Ezab El Qasr [53], 28 March 2011: coll. 1 ma, NMP (Benda et al. 2014a, b); – Dakhla Oasis, Hindaw [54], village, 5 January 2011: 1 ind. (Benda et al. 2014a); – Dakhla Oasis, Ismant [55], medina, crevice in an abandoned house, 28 November 2010: obs. 3 inds., 5 January 2011: exam. 6 ma, NMP (Benda et al. 2014a, b); – Dakhla Oasis, Mushiye [56], 25 March 2011: net. 1 ind. (Quetglas et al. 2012); Dakhla Oasis, Mushieh, above a small pool, 27 November 2010: det. calls of ca. 5 inds. (Benda et al. 2014a); – Dakhla Oasis, Mut [57], medina, 22 January 2010: det. calls of 2 foraging inds., 13 December 2010: obs. & det. calls of several inds. (Benda et al. 2014a); Mut, above a lake, 15 October 2011: det. calls of tens of inds. (Benda et al. 2014a); – Dakhla Oasis, Rashda [58] (Azim 1936); – El Kharga Oasis [59], palm orchard at the S edge of the town, 23 January 2010: det. calls of 1 foraging ind. (Benda et al. 2014a). – E s S u w a i s: Suez [60] and its neighbourhood, 7 m, 7 f (Anderson 1902); Suez, 2 m, MNCN (Ibáñez & Fernández 1989). – E s h S h a r q i y a h: El Salhiya [61], 2 inds., BMNH (Qumsiyeh 1985); – zw. Kairo und Ismailia [62], 5 September, 1 ind., SMF (Kock 1969); zw. Cairo und Isma'iliya, 1 ind., SMF (Kock et al. 1972); between Cairo and Ismailia, 5 September 1962: 1 ind., SMF (Benda et al. 2004c, 2014b, 2015); – San El Hagar El Gibiliya [63], Nile Delta, irrigation channel, 20 September 2005: net. 5 ma, 2 ms, 3 fa, NMP (Benda et al. 2008, 2014a, b, 2015). – K a f r E s h S h e i k h: Beltim (Delta) [64], 3 m (Anderson 1902). – M a t r u h: Roman burial cave in the Mediterranean coastal semidesert, colony roost (Hoogstraal 1962); El Qasr [65], near Mersa Matruh, 41 inds., FMNH, USNM (Qumsiyeh 1985); – Near El Qasr 5 mi. W. of Mersa Matruh [66], April (Hoogstraal & Traub 1963); 1 mi. W. El Qasr, Mersa Matruh, 28 April 1959: 1–2 inds. (Radovsky 1967); 1 mi W El Qasr, near Mersa Matruh, 12 inds., FMNH, USNM (Qumsiyeh 1985); – Mersa Matruh [67], city, 8 March 2012: det. calls of 2 inds. (Benda et al. 2014a); – 15 mi. N. W. of Mersa Matruh [68], 23 September 1959: inds. (Usinger 1960, 1966); island near Mersa Matruh, colony roost (Hoogstraal 1962); Unnamed island in Mediterranean 15 mi. n.w. of Mersa Matruh, September (Hoogstraal & Traub 1963); – Siwa Oasis, Shali [69], ruins at the citadelle hill, 7 March 2012: net. 1 ma, 1 fa (Benda et al. 2014a); Siwa, Shali, ruins in the medina, 5 March 2012: obs. & det. calls of a colony emergence, >30 inds. (Benda et al. 2014a); – Siwa Oasis [70], at a small pond, 6 March 2012: obs. & det. calls of ca. 20 foraging inds. (Benda et al. 2014a); – Zawyet Umm El Rakham

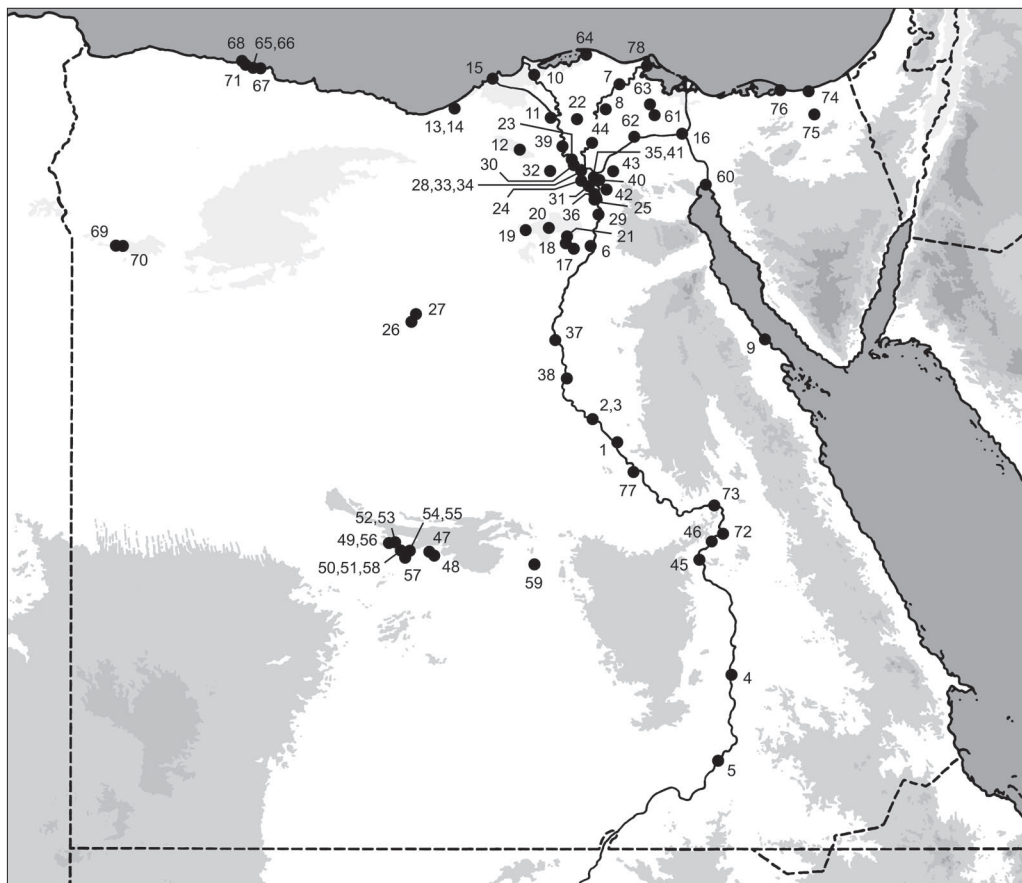


Fig. 21. Records of *Pipistrellus kuhlii* (Kuhl, 1817) in Egypt; for explanations see Fig. 3.

[71], 150 inds., FMNH, HZM, USNM (Qumsiyeh 1985). – Q e n a: Khayzam [72], 1 f (Anderson 1902); – Qena [73] (Sanborn & Hoogstraal 1955); Qena (Hoogstraal 1962). – S h a m a l S i n a': El-Arish [74], August 1951: 8 f, ASUC (Wassif et al. 1984); – Magdabah [75], 30 km south of El-Arish, roof of the one-chambered police post, summer 1951: coll. 3 m, 2 f (Wassif 1953); – Zarnikh Is. [76], Sabkhet El Bardawil, 1 ind., HZM (Qumsiyeh 1985); Zarnikh, 20 km west of El Arish, 1 ind., HZM (Harrison & Bates 1991). – S o h a j: Sohag [77], old house, coll. 150 inds. (Abdel-Rahman et al. 2001).

IMPRECISE RECORDS. Egypte (Geoffroy 1806 [as *Vespertilio pipistrellus*]); Aegypten, 1 ind., SMF (Rüppell 1842b [as *Vespertilio marginatus*]); Égypte (Gervais 1854 [as *Vespertilio pipistrellus*]); Aegypten (Kolenati 1858b [as [*Vespertilio*] *marginatus*]); Ägypten (Müller 1858, Kolenati 1859b [as *Nannugo Kolenatii*]); Ägypten (Fitzinger & von Heuglin 1866, Fitzinger 1870d [as *Vesperugo marginatus* and *V. Ursula*]); Ägypten (von Heuglin 1877); Egypte (Trouessart 1879); Alto Egitto, 1 ind., MSNG (Doria 1887); Aegypten, 1 f, ZMH (Noack 1891); Aegypten, Januar 1898: 1 ind. (Looss 1899); Egipto, 2 inds., MNCN (Cabrera 1912); Aegypten, 1 ind., SMF (Mertens 1925); Egypte (Gohar 1934); Egypt (Allen 1939); Egypte (Dubois 1955); Egypt (Hoogstraal 1955, 1956); Egypt, 11 inds. (Wells & Randall 1956); Egypt (Theodor 1957); Égypte (Dubois 1960); Egypt (Myers et al. 1962); Egypt, coll. inds. (El Sabban et al. 1967); Ägypten, 1 ind., SMF (Kock 1969); Ägypten, 1 ind., SMF (Kock et al. 1972); Egypt (Madkour 1976b); A. R. Egypt, inds. (Madkour 1977c); Egypt, 8 inds., BMNH, SMNS, USNM (Qumsiyeh 1985); Egypt, 6 m, 8 f (Riad et al. 2000); Egypt, February 2013 – April 2015: coll.

31 inds. (Shehata et al. 2016 [as *P. deserti*]); Egypt, 2016–2017: 92 inds. (Kandeil et al. 2019 [as *P. aegyptius*]). – Nubien (Cretzschmar 1830 [as *Vespertilio marginatus*]); Nubie (Temminck 1840 [as *Vespertilio marginatus*]); Nubien (Schinz 1840, Wagner 1840 [as *Vesperugo marginatus*]); Nubien (Blasius 1857); Nubien (Kolenati 1860a [as *Nannugo marginatus*]); Nubien (von Heuglin 1861b, Fitzinger & von Heuglin 1866, Fitzinger 1870d [as *Vesperugo marginatus*]); Nubien (von Heuglin 1877); Nubie (Trouessart 1879); Nubia (Thomas 1902, Flower 1932); Nubia and Petraean Arabia (= Lower Egypt sensu Anderson 1902), 1822: 1 ind., SMF (Benda et al. 2006, 2014b, 2015). – petraeische Arabien (Cretzschmar 1830 [as *Vespertilio marginatus*]); peträischen Arabien (Wagner 1840 [as *Vespertilio marginatus*]); peträischen Arabien (Kolenati 1856); peträischen Arabien (Kolenati 1860a [as *Nannugo marginatus* and *N. kuhlii*]); peträische Arabien (von Heuglin 1861a, b, Fitzinger & von Heuglin 1866 [as *Vesperugo marginatus*]); Sinaitische Halbinsel (von Heuglin 1877). – Upper Egypt, 2 m, BMNH, NMW (Hill & Harrison 1987 [as *P. deserti* and *P. kuhlii*]). – Giza [23–36] and/or Damietta [78] Governorates, May–October 2016: net. 93 inds. (El Taweel et al. 2020 [as *P. aegyptius*]). – vicinity of Cairo [40–43] and Giza [23–36] Province, October 1959 – October 1961: 37 inds. (Mohammed & Saoud 1965). – Cairo [40–43], El Fayum [17–21] and Giza [23–36] governorates, 20 inds. (Morsy et al. 1987b).

DISTRIBUTION. *Pipistrellus kuhlii* is a very common bat species in Egypt, it has been found in 78 localities and represents the second most frequently documented bat of the country after *Rousettus aegyptiacus* (Fig. 21; Table 2). However, *P. kuhlii* is the most widespread bat of Egypt, distributed over all geographical parts of the country (Table 2). In majority of these regions it belongs to the most frequently found bat (Fig. 21), at the Mediterranean Sea shore *P. kuhlii* is the commonest bat species at all. It is the second most widespread bat in the Cairo Region, Nile Valley, Nile Delta, and in the oases of the Western Desert (Table 2). The records of *P. kuhlii* are distributed regularly in the whole Egyptian length of the Nile Valley (Fig. 21).

The Egyptian records of *P. kuhlii* are available from a very narrow altitude range of –42–179 m a. s. l. (median 27.0 m, mean 47.0 m; Fig. 4, Table 3). The localities in the continental African part of Egypt and in Sinai lie in altitude ranges very similar to each other; in the range of –42–179 m a. s. l. in the continent (median 27.5 m, mean 47.5 m), and of 3–88 m a. s. l. in Sinai (median 16.0 m, mean 35.7 m; Fig. 5, Table 4). Hence, *P. kuhlii* along with *Rhinolophus mehelyi* and *Taphozous nudiventris* are the most lowland bat species of Egypt.

The oldest undoubted report of *P. kuhlii* from Egypt was published by Cretzschmar (1830: 74), who localised the respective records to ‘Nubien und das petraeische Arabien’, based on a specimen collected by Eduard Rüppell on his trip to north-eastern Africa and the adjacent part of Arabia in 1822. These distribution data were followed by numerous authors through the 19th century (see above). However, *P. kuhlii* remained unknown in Nubia until 1904, when it was collected at Shereik, Sudan, by Charles Rothschild and his company (Schwann 1905); later on this bat was found additionally in Wadi Halfa, Sudan (Kock 1969), and Sayala, Egyptian Nubia (Gaisler et al. 1972, published as *Pipistrellus ariel*). Nevertheless, the occurrence of *P. kuhlii* in Nubia is scarce and in the Sahara this bat reaches the southern margins of its distribution range in Africa (see also Benda et al. 2014b, Ahmim & Oubaziz 2017, Aulagnier et al. 2017).

On the other hand, in Petraean Arabia, i.e., in the mountains of southern Sinai (cf. von Heuglin 1877), *P. kuhlii* remains unknown until now (despite the extensive research done there, see Dietz 2005b, Dietz & Maltby 2006, Truscott 2007, Benda et al. 2008, Foui 2011), although several records are available from the lowland deserts of northern Sinai and adjacent regions of Egypt and the Levant (see above and Fig. 21). This absence of records of *P. kuhlii* in southern Sinai suggests the real absence of this bat in the region. Moreover, Rüppell (1842b) himself reported the concerned specimen as originating from ‘Aegypten’ and later, Anderson (1902) reported the label of the specimen bearing the locality ‘Egypt’. Thus, *P. kuhlii* perhaps really does not occur in southern Sinai and this region represents a gap in the continuous distribution of this bat at the Afro-Arabian transition.

The current picture of *P. kuhlii* distribution in Egypt conforms generally to the view given by Qumsiyeh (1985), with the exception of the newly discovered occurrence in the Western Desert

that was not available to this author (the record from Rashda, Dakhla Oasis, published by Azim 1936 remained overlooked generally, see Benda et al. 2014a). In some regions the numbers of records have increased significantly, namely in the Cairo Region, Nile Valley, and Nile Delta, where the numbers are currently almost twice higher than Qumsiyeh (1985) reported. On the other hand, in northern Sinai and the Mediterranean Sea shore the numbers of records remain almost unchanged compared to Qumsiyeh (1985).

The Egyptian distribution range of *P. kuhlii* is a part of a belt of abundant occurrence of this bat in northern Africa and the Mediterranean Basin as well (Benda et al. 2015). While the occurrence of the species has its southern limits in the central longitudes of the Sahara and only few records are available south of the Egyptian borders (see above), in the countries neighbouring Egypt in the west and east, *P. kuhlii* represents the most common and widespread bat species, in the Maghreb and Libya, as well as in the Levant and most of the Middle East (Harrison & Bates 1991, Mendelssohn & Yom-Tov 1999, Puechmaille et al. 2012, Benda et al. 2010, 2012b, 2014b, Ahmim & Oubaziz 2017, Aulagnier et al. 2017).

TAXONOMY. As already mentioned, the first undoubted finding of *Pipistrellus kuhlii* in Egypt was made by Eduard Rüppell in 1822; this record was published by Cretzschmar (1830) as a description of a new species, *Vespertilio marginatus*. Although Cretzschmar (1830: 74) localised the respective record to ‘Nubien und das petraeische Arabien’, the type specimen is labelled to come from ‘Aegypten’ (Rüppell 1842b, Anderson 1902, Mertens 1925, Kock 1969, own obs. 1998), and thus, the type locality of *V. marginatus* is ‘Egypt’ (see Allen 1939, Ellerman & Morrison-Scott 1951, Gaisler et al. 1972, Koopman 1975, Benda et al. 2006, 2014b, 2015).

Some older authors considered *Vespertilio marginatus* (or in another combination as *Vesperugo marginatus*) a full species separated from the European *P. kuhlii* and occurring in north-eastern Africa, whole northern Africa, or even northern Africa and the Middle East, in terms of its original description (Temminck 1840, Schinz 1840, Wagner 1840, Rüppell 1842b, Kolenati 1858b, 1860a, von Heuglin 1861a, b, Fitzinger & von Heuglin 1866, Fitzinger 1870d). Although these two names – *marginatus* and *kuhlii* – were relatively early synonymised under the latter name (Kolenati 1856, Blasius 1857, von Heuglin 1877, Dobson 1878, Trouessart 1879, Lataste 1885, Anderson 1902, Thomas 1902, etc.), some modern authors regarded the name *marginatus* being valid as a subspecies name (Gaisler et al. 1972, Qumsiyeh 1985, 1996, Koopman 1994, López-Baucels 2019a). Perhaps because of a rather extensive geographical variability of *P. kuhlii* (particularly in the colouration of the pelage and wing membranes) throughout its distribution range and even in Egypt, Koopman (1975: 400) suggested to restrict the type locality of *V. marginatus* more specifically, so that a particular population could be referred to this name rather than all populations of Egypt. Based on comparison of the original description, he tried to identify the population of the type specimen origin, see as follows: “since the plate with the original description shows a bat with a narrow white edging on the wing, it is evident that the type specimen came from the Nile Valley or eastern desert, rather than the western desert where the white edging is wide”. This restriction has been accepted by Qumsiyeh (1985, 1996) who considered this name valid for designation of the northern African and Middle Eastern populations of *P. kuhlii*.

However, such delimitation of the type locality has two problematic points; (1) the colouration gradient in the northern African populations of *P. kuhlii* runs in the north-south direction and not in the east-west direction, the northern populations are dark coloured, southern populations pale coloured (despite their ‘western’ or ‘eastern’ origin); and (2) the illustrations in the Cretzschmar’s (1826–1830) book are black prints, hand-coloured, and thus, their non-standard colouration can only hardly be a relevant reference to the original state of the type specimens, including that of *V. marginatus*. For example, based on the colours in the figure of this bat in the Cretzschmar’s

book copy kept in the NMP library (Fig. 22), one cannot identify it as *P. kuhlii*. The colouration indicates a bat dark brown coloured on the back and pale on the belly, with uniformly brown wing membranes, without the white margins typical of *P. kuhlii* and universally present among the members of its Egyptian populations. The authors who examined the type specimen of *V. marginatus* (Anderson 1902, Kock 1969, Kock et al. 1972, Benda et al. 2006, 2014b) did not report any detail concerning its colouration traits, only Blasius (1857: 65) mentioned the presence of white margins on the wing membranes, though not their widths.

The lectotype specimen of *V. marginatus* (SMF 4307) represents a mounted skin, originally containing skull inside, but currently with the skull extracted (pers. obs. 1998). The colouration of the pelage and wings is faded due to the long-time exposition of the mounted specimen to day light and although it shows roughly the colouration signs of *P. kuhlii*, the intensity of the colour tinges cannot be evaluated correctly. Since there also is a gradient of the decreasing body size in northern Africa, running in the same direction as the gradient in colouration (Benda et al. 2014b, 2015), a comparison of body dimensions of the type specimen of *V. marginatus* could indicate its geographical origin. The standard forearm length cannot be taken from the specimen due to its preparation as a ‘flying’ bat with outstretched wings. In the skull extracted from the type, the neurocranium is badly damaged and only dimensions of the rostrum including the tooth-rows can be taken from it in a standard way (Table 5). The comparisons of several rostrum dimensions of the type specimen with those of geographically defined samples of *P. kuhlii* from north-eastern Africa (Egypt, Libya, Sudan; Figs. 23, 24) demonstrated the size position of the type specimen as intermediate between the *kuhlii*- and *deserti*-morphotypes (sensu Benda et al. 2014b, 2015). While the large-sized *kuhlii*-morphotype occurs in a belt of mesic areas ca. 250–300 km wide, stretching along the Mediterranean Sea coast, the small-sized *deserti*-morphotype occurs in the most arid areas of the Sahara situated south of a line going at the distance of ca. 250 km south



Fig. 22. An image of *Vespertilio marginatus* Cretzschmar, 1830 [= *Pipistrellus kuhlii* (Kuhl, 1817)] published as an illustration of the species description (Cretzschmar 1826–1830: Table 29).

Table 5. The available basic biometric data on skull of the lectotype specimen of *Vespertilio marginatus* Cretzschmar, 1830, compared to the data on the specimen sets of *Pipistrellus kuhlii* (Kuhl, 1817) from north-eastern Africa (Egypt, Sudan, Libya) grouped to the size morphotypes defined by Benda et al. (2014b); s.a. = standard abbreviation

dimension	s.a.	<i>Vespertilio marginatus</i> SMF 4307	n	<i>kuhlii</i> morphotype min–max	n	<i>deserti</i> morphotype min–max	n	intermediate morphotype min–max
infraorbital width	LaInf	3.67	79	3.68–4.43	42	3.31–3.74	10	3.87–4.32
rostral width across canines	CC	3.87	80	3.82–4.75	41	3.32–3.83	17	3.73–4.53
rostral width across upper molars	M ³ M ³	4.95	81	5.31–7.66	41	4.62–5.35	18	5.27–5.87
upper tooth-row length	CM ³	4.52	80	4.59–5.27	42	3.98–4.56	18	4.44–4.96
lower tooth-row length	CM ₃	5.02	80	4.89–5.58	43	4.24–4.83	18	4.77–5.63

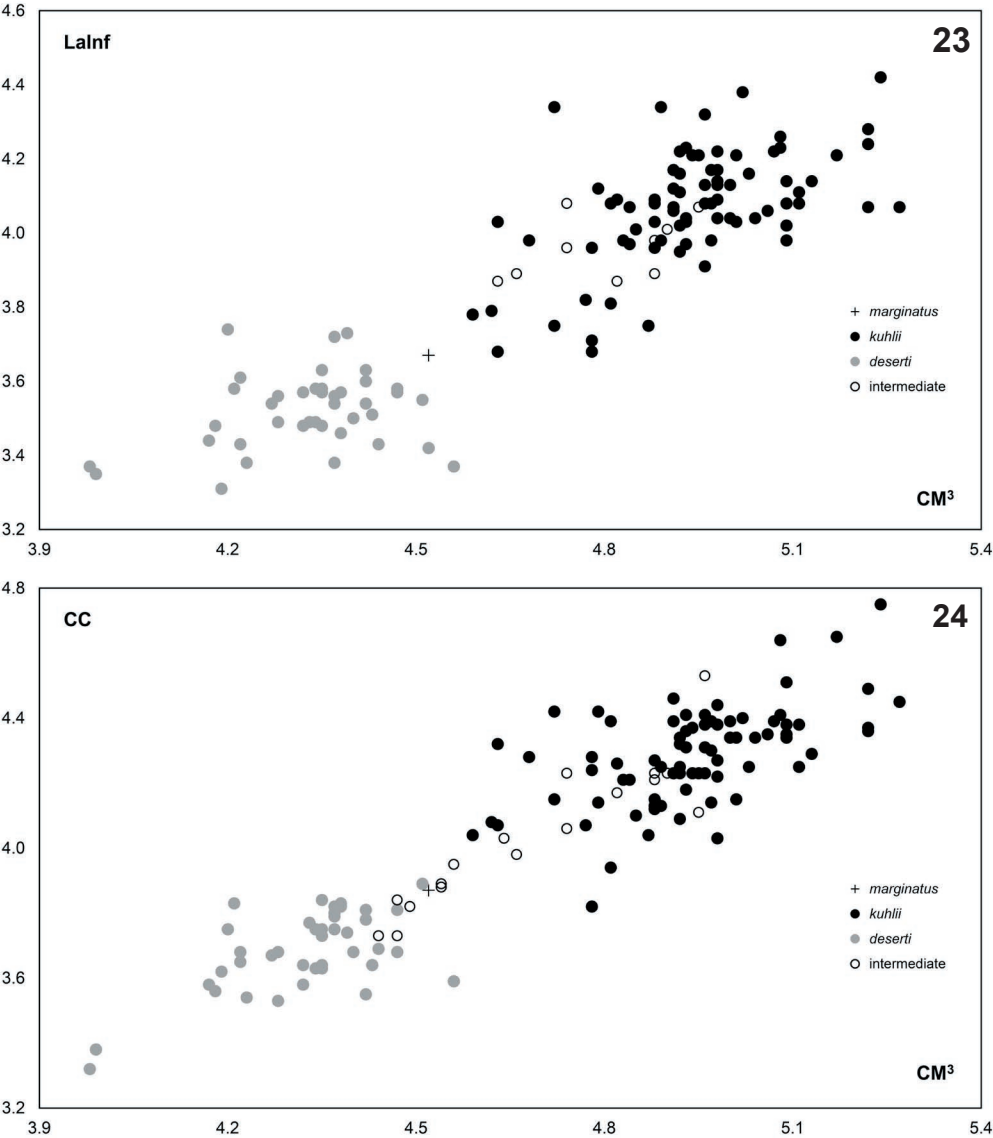
of the Mediterranean Sea coast; thus, the origin of the type specimen of *V. marginatus* could be estimated in a region lying between the occurrence areas of these two morphotypes. This area could be defined as a belt stretching at the distance of approximately 200–300 km south of the Mediterranean Sea shore, i.e., concerning Egypt, approximately between the parallels 29°N and 28°N (cf. Benda et al. 2014b, 2015). This morphometric definition also supports the origin of the type specimen of *V. marginatus* in Egypt proper (contra Cretzschmar 1830), since in Sinai, the large-sized *kuhlii*-morphotype occurs, and in Nubia, the small-sized *deserti*-morphotype is present (Qumsiyeh 1985, Benda et al. 2015). The origin of the type specimen should be placed to the area lying between these two extremes (naturally, when we do not accept the premise that the type specimen is an aberrant individual of *P. kuhlii*; at least, we did not find any sign supporting such fact).

Considering the route of Rüppell’s journey to the Orient in 1822–1827, from which the type specimen came, the collection of the type specimen of *V. marginatus* in Egypt could have been made in the Nile Valley between Cairo and New Dongola or on the way between Thebes and El Qoseir, in late 1822 or early 1826 (Rüppell 1829). Since Thebes and supposedly also El Qoseir lie in the zone of the *deserti*-morphotype occurrence, the collection site could be situated in and the type locality restricted roughly to a part of the Nile Valley between Cairo and Thebes; regarding the above indicated north-south division of the occurrence of particular morphotypes of *P. kuhlii* in Egypt, the type locality of *Vespertilio marginatus* Cretzschmar could be here restricted approximately as the Nile Valley section delimited by Beni Suef [29°04’N, 31°06’E] in the north and by El Miniya [28°05’N, 30°46’E] in the south.

The collection of the type specimen of *V. marginatus* by Rüppell in 1822 could be considered as the first undoubted record of *P. kuhlii* from Egypt since its correct species identification can be revised and confirmed by examining the SMF specimen. However, two older records from Upper Egypt are available that were formerly also assigned to *P. kuhlii*, but later this species identification was doubted. These records were first indicated by Geoffroy (1806: 196), who, based on specimens collected by him at the time of the French occupation of Egypt in 1798–1801, reported an occurrence of a variety of *Vespertilio pipistrellus* [= *Pipistrellus pipistrellus* (Schreber, 1774)] in this country. Later Geoffroy (1818: 117) specified the occurrence area and the sites of collection of the bats as follows: “La pipistrelle est également répandue dans toutes les parties de l’Égypte. Elle se contente d’une retraite peu profonde: j’en ai trouvé plusieurs individus à Thèbes, dans les catacombes des particuliers, et à Qâou el-Koubarä, dans des interstices de colonnes”.

The Geoffroy’s (1818) indication of an Egyptian variety of the European *P. pipistrellus* was mentioned again by Desmarest (1820: 140) from both sites reported by Geoffroy, ‘Thèbes’ and

‘Qiâou-el Koubara’ [= Qau El Kebir; = El Etmannyieh, ca. 40 km SE Asyut, 26°54’N, 31°31’E], and by Fischer (1829: 105), who created a new name for this variety, *Vespertilio Pipistrellus* *β. Aegyptius*, but reported it from just one site, Thebes (“in cryptis Thebarum Aegypti”). Hence, only



Figs. 23, 24. Bivariate plots of rostral dimensions (in millimetres) of the lectotype specimen of *Vespertilio marginatus* Cretzschmar, 1830 and comparative sets of specimens of *Pipistrellus kuhlii* (Kuhl, 1817) from north-eastern Africa grouped to the size morphotypes defined by Benda et al. (2014b), see also Table 5. 23 – upper tooth-row length (CM³) against the infraorbital width (LaInf); 24 – upper tooth-row length (CM³) against the rostral width across upper canines (CC).



CHAUVE-SOURIS D'ÉGYPTE. — Osteologie.
 1.5 NYCTÈRE DE LA THÉBAÏDE. 2.5 RHINOLOPHIE TRIDENT. 3.5 NYCTINONE D'ÉGYPTE. 4.41 TAPIEN PERFORÉ. 5.5 VESPERTILION PIPISTRELLE. 6 TAPIEN FILET.

Fig. 25. Images of skulls of six Egyptian bat species published by Geoffroy (1818: Plate 4).

the first site mentioned by Geoffroy (1818), Thebes [$25^{\circ}44'25''\text{N}$, $32^{\circ}36'06''\text{E}$], represents the type locality of the new name. Since the availability and history of use of *Vespertilio pipistrellus aegyptius* Fischer were discussed in detail by Kock (1999b), only certain points concerning this name are remembered here.

The reports by Geoffroy (1806, 1818) and Fischer (1829) were accepted as indications of occurrence of *P. pipistrellus* in Egypt or even in North Africa by several authors (Gervais 1854, von Heuglin 1877, Dobson 1878, Trouessart 1879, 1897), while others suggested it to be a synonym of another species. Fitzinger & von Heuglin (1866) and Fitzinger (1870d) regarded it a synonym of *Vespertilio Ursula* Wagner, 1840, though in a curious arrangement since *ursula* Wagner is a younger name than *aegyptius* Fischer (its possible synonymy was suggested already by Wagner 1840). Since *V. ursula* Wagner (type locality Morea = Peloponnese, Greece) was synonymised with *V. kuhlii* Kuhl [= *Pipistrellus kuhlii*] (see Anderson 1902, Miller 1912, Ellerman & Morrison-Scott 1951, Kock 1969, Koopman 1993, Bogdanowicz 2004, Simmons 2005, etc.), also the name *aegyptius* Fischer fell into the synonymy of the latter name (Anderson 1902, Allen 1939, Ellerman & Morrison-Scott 1951, Kock 1969, Koopman 1975, Corbet 1978, Le Berre 1990). The possibility of occurrence of *P. pipistrellus* in Egypt was thus rejected and the respective records considered as of *P. kuhlii*.

As mentioned above, some authors considered the name *Vespertilio marginatus* Cretzschmar being appropriate for designation of the subspecies of *P. kuhlii* they suggested to occur in Egypt and surrounding countries, a view introduced by Gaisler et al. (1972). However, Koopman (1975: 400) pointed out correctly the priority of *aegyptius* Fischer over *marginatus* Cretzschmar and suggested to use the former name for the respective subspecies. On the other hand, Qumsiyeh (1985) suggested *Vespertilio pipistrellus aegyptius* Fischer to be regarded a senior synonym of *Pipistrellus deserti* Thomas, 1902, a name established for the small-sized desert form of *P. kuhlii* (see above) that was considered a separate species for a long time (for a review see Benda et al. 2015: 419–420). As a species, *P. deserti* was described by Thomas (1902) based on a single male collected from ‘Murzuk, Tripoli’ [= Murzuq, Fezzan, Libya; $25^{\circ}54'31''\text{N}$, $13^{\circ}55'05''\text{E}$], its occurrence in Egypt was first demonstrated by Gaisler et al. (1972), who collected a series of 16 these bats in Luxor. The use of the name *aegyptius* Fischer instead of *deserti* Thomas in terms as suggested by Qumsiyeh (1985) was then accepted by several authors (Koopman 1993, 1994, Nowak 1994, Decher et al. 1997).

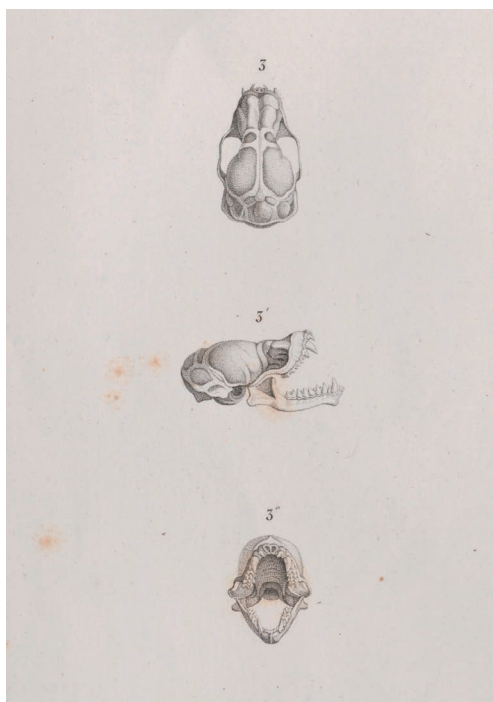


Fig. 26. Enlarged image of the skull of *Vespertilio pipistrellus* [Schreber, 1774] (la pipistrelle d'Égypte) [= *Pipistrellus kuhlii* (Kuhl, 1817)] published by Geoffroy (1818), a section of the Plate 4 (Fig. 25).

Kowalski & Rzebik-Kowalska (1991) and Kock (1999b) suggested to consider the name *Vespertilio pipistrellus aegyptius* Fischer a nomen dubium, since – according to their views – it is not possible to associate this name undoubtedly with any of the bat species occurring in Egypt (contra Qumisyeh 1985). Kock (1999b) argued against the suggestion by Qumisyeh (1985) to see this name affiliable to *P. deserti* and according to a very simple description by Fischer (1829), Geoffroy (1806, 1818) and Desmarest (1820), to any other bat that they enumerated to occur in Thebes or in Egypt as well. The descriptions by the old authors defined *aegyptius* as an Egyptian variety of *P. pipistrellus*, sharing all characters with the European conspecific, but the pelage colour which is cineraceous (ashy) instead of brown.

Most probably, the reference to ashy colour indicates just pale colouration in contrast to the dark brown pelage of the European form, rather than a real cineraceous tinge of the pelage, since this colour is actually not present in any of the Egyptian bats. In respect to here reviewed fauna of Egypt and considering the type locality (Thebes), three species could be considered as possible candidates to be assigned to *Vespertilio pipistrellus aegyptius* Fischer, viz. *Pipistrellus kuhlii*, *Vansonia rueppellii*, and *Hypsugo ariel*. The latter two species are extremely rare in the Nile Valley (only one record is available per species), while *P. kuhlii* is a common species there*. In his *Synopsis mammalium*, besides *V. Pipistrellus* β . *aegyptius*, Fischer (1829) described also *Vespertilio Rüppelii* (= *Vansonia rueppellii*), and thus, it can be assumed that one species is not described by two names in one work (although we cannot exclude it absolutely). However, from the depiction of skull of *Vespertilio pipistrellus* published by Geoffroy (1818: Pl. 4), the identification of *P. kuhlii* is clear (see Fig. 26); the skull shape (side profile of the neurocranium) conforms to the genus *Pipistrellus*, but not to *Hypsugo* Kolenati, 1856 or *Vansonia* Roberts, 1946, and mainly, the shape and size of upper incisors undoubtedly indicate *P. kuhlii*, but not *P. pipistrellus*, *H. ariel*, or *V. rueppellii*. Since in the original caption on Plate 4 in Geoffroy (1818), the image of the skull of '*Vespertilio pipistrellus*' of Geoffroy [= *Pipistrellus kuhlii*] was marked erroneously as 'Nyctinôme d'Égypte', while the mark '*Vespertilion pipistrelle*' is found in '*Plecotus auritus*' of Geoffroy [= *Plecotus christii*], Plate 4 with skull images of particular bat species was perhaps overlooked, although it gives clear information concerning the real identity of bat species reported by Geoffroy (1818).

Considering the Geoffroy's (1818) description, depictions of the bat and its skull (Figs. 9, 26), and the probability of collection (based on the known frequency of particular species records in Upper Egypt), we consider appropriate to keep the name *V. pipistrellus aegyptius* Fischer a synonym of *Vespertilio kuhlii* Kuhl, following Anderson (1902) and numerous other authors (see above). We thus regard the Qumisyeh's (1985) approach fitting well the matter and his choice to synonymise *Vespertilio pipistrellus aegyptius* Fischer with *Pipistrellus deserti* Thomas (= *Vespertilio kuhlii* Kuhl) was justified. Currently, when the species status of *P. deserti* / *P. aegyptius* has been reasonably challenged and the respective populations are considered just a desert morphotype of *P. kuhlii* (see below and Benda et al. 2015), this synonymy has not a problematic point concerning the affiliation to a real bat species (contra Kowalski & Rzebik-Kowalska 1991 and Kock 1999b).

* NOTE. Geoffroy (1818: 117) stressed the occurrence of his *Vespertilio pipistrellus* in all parts of Egypt (= the parts he visited, i.e., the whole Nile Valley, Cairo Region, and Nile Delta), and an evidence (collection?) of 'plusieurs individus' in Thebes and in Qau El Kebir. However, besides the image (Geoffroy 1818; Figs. 9, 26) based on a (type) specimen of this bat, the whereabouts of the specimen/s collected by Étienne Geoffroy Saint-Hilaire in Egypt and representing in fact the types of *Vespertilio pipistrellus aegyptius* Fischer are unknown. Theoretically, such material could still survive in the MNHN collection along with other Geoffroy's specimens from Egypt. Kock (1999b) stressed that no specimen referable to *Vespertilio pipistrellus aegyptius* Fischer is listed in the MNHN type collection (Rode 1941), but Paul Rode could have overlooked it, since the description by Fischer (1829) was based on a published indication of the Egyptian variety and not on a primarily examined specimen/s.

A third name which is synonymous to *P. kuhlii* with most probability and is based on a material collected in Egypt, is *Nannugo Kolenatii* Müller, 1858. Although originally the name was available, being accompanied with a description (Müller 1858), it remained almost overlooked and not mentioned among the known bat names in the involved compendia (see Kolenati 1860a, Dobson 1878, Fitzinger 1870d, von Heuglin 1877, Anderson 1902, Allen 1939, Ellerman & Morrison-Scott 1951, Corbet 1978, Qumsiyeh 1985, Ansell 1989, Koopman 1993, Simmons 2005, Hoffmann et al. 2009); until now it was mentioned in four papers only (Kolenati 1859b: 174; 1860a: 16; Müller 1860: 48; Kock 1999b: 104). Müller (1858) obtained the type specimens in 1856 from Johann Zelebor (1819–1869), a taxidermist at the NMW, who collected them in Egypt in 1855. According to Müller's very precise description, the species represents *Pipistrellus kuhlii* in fact and the name *Nannugo kolenatii* Müller is a junior synonym of the former name (now, it is an unavailable name since it represents a nomen oblitum). Müller (1858: 76–78) gave it a vernacular name 'Die weissgesäumte Fledermaus' [= white hemmed bat], describing a character referring clearly to *P. kuhlii*, he reported the forearm length 29.8 mm, and provided a figure of ear and tragus. Finally, Müller (1858) included a differential diagnosis, where he mentioned only one character to distinguish *Vesperugo marginatus* Cretzschmar [= *P. kuhlii* (Kuhl)] from his *Nannugo kolenatii*, the number of incisors in the lower jaw: six in *V. marginatus* and four in *N. kolenatii*, in which the missing teeth are substituted by gaps in the tooth-rows between incisors and canines – apparently, the outer lower pair of incisors in the type specimen was worn or just missing. The species identification of *N. kolenatii* as *P. kuhlii* was indirectly confirmed already by Friedrich A. Kolenati (1812–1864), a professor of natural history in Brno, Moravia [now in the Czech Republic], a person to whom the new bat was dedicated. Kolenati (1858b) described a parasite *Ichoronyssus foveolatus* Kolenati from [*Nannugo*; = *Pipistrellus*] *marginatus*, while in a review published a year later, Kolenati (1859b) mentioned the same record from *N. kolenatii*, and again a year later (Kolenati 1860a: 71) from *N. marginatus*. This parasite name is now considered a nomen dubium (Radovsky 1967) and was mentioned repeatedly just from one finding by Kolenati (1858b, 1859b, 1860a) and Müller (1860), two host species are thus out of question.

The type locality of *Nannugo kolenatii* is 'Egypt', Müller (1858: 78) specified the area of occurrence of this bat as follows: "In Nord-Afrika, besonders Aegypten, in Gesteins-Mauer und Baumritzen (Zelebor)". Müller (1858) declared that a part of the type material should remain in the NMW collection and a part in the personal collection of F. A. Kolenati in Brno. While the Kolenati's collection did not survive until now, only some specimens that are spread over various museums (Flasar 1997), in the NMW collection, a specimen of *P. kuhlii* is housed (NMW 27498) that can be possibly a part of the Zelebor's estate and originates in Egypt. This specimen thus could be one of the types of *Nannugo kolenatii*; however, it was discovered hidden in the NMW first in 1882 by Emil von Marenzeller (1845–1918), and the data on the specimen are only estimated (A. Bibl, NMW, in litt.). Thus, the existence of the type material of *N. kolenatii* remains uncertain.

History of the taxonomic opinions concerning the Egyptian populations of *P. kuhlii* is roughly outlined in the above paragraphs. These population were originally affiliated to several names, by some authors even considered as several separate species living in Egypt side by side, viz. (in original combinations), *Vespertilio kuhlii* Kuhl, *Vespertilio pipistrellus aegyptius* Fischer, *Vespertilio marginatus* Cretzschmar, *Vespertilio ursula* Wagner, *Nannugo kolenatii* Müller, and *Pipistrellus deserti* Thomas. Apart from the latter one, all these names were synonymised under the senior name *Pipistrellus kuhlii* by Anderson (1902: 124); at that time, a geographical variability within the species was not considered and the Egyptian populations were regarded a part of the European taxon.

Until the late 1960s, only the large-sized morphotype of *P. kuhlii* was known from Egypt and it was assessed as *P. kuhlii kuhlii*, a circum-Mediterranean form of the species, occurring in sou-

thern Europe, North Africa and according to some authors also in the Middle East (Allen 1939, Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Hoogstraal 1962, Hayman & Hill 1971, Simmons 2005). From other forms of the species, the sub-Saharan African (then considered a part of *P. kuhlii*) and southern Asian ones, the nominotypical subspecies was distinguished by the colouration of pelage, being relatively dark, and of wing membranes, having a conspicuous white margin of a variable width. Other authors (Gaisler et al. 1972, Koopman 1975, Qumsiyeh 1985, 1996, Koopman 1994, López-Baucels 2019a) regarded the Egyptian populations of *P. kuhlii* differing from the European and Asian populations and delimited them as a subspecies of its own, named most frequently as *P. kuhlii marginatus*, only Koopman (1975) suggested to use the name *P. kuhlii aegyptius*. Besides Egypt, this subspecies was reported variably to occur also in the Sudan, Maghreb, Libya, and/or the Middle East.

When Gaisler et al. (1972) discovered the small-sized morphotype of *P. kuhlii* in Egypt, they assigned it to a separate species, *P. deserti*, in line with conception concerning the previous records of this form from Libya and Algeria (Allen 1939, Ellerman & Morrison-Scott 1951, Hayman & Hill 1971), a view accepted by numerous other authors (see the review by Benda et al. 2015). Only Qumsiyeh (1985) suggested to use the name *aegyptius* Fischer instead of *deserti* Thomas, and this opinion was accepted by some authors until Kock (1999b) proposed to regard the former name a nomen dubium and then, the name *deserti* Thomas was again taken to use (see above).

However, the full species status of the small-sized morphotype was accepted by some authors only with a question mark, or it was even considered a part of *P. kuhlii* (e.g., Hayman & Hill 1971, Koopman 1975, Corbet 1978, Benda et al. 2004c, Dalhoumi et al. 2011). Finally, based on the morphometric comparison of a large set of specimens of both morphotypes from various parts of North Africa (including Egypt) and the results of their molecular genetic analysis, Benda et al. (2015) demonstrated the large-sized *kuhlii*-morphotype and small-sized *deserti*-morphotype to be extremes of a cline directed in the north-south course (see also Figs. 23, 24) within one, genetically uniform species. Thus, *P. deserti* Thomas is currently regarded a junior synonym of *P. kuhlii* (see López-Baucels 2019a).

The body size and the colouration tinge – including the width of the white margin of the wing membranes – were thus shown to be useless for taxonomic evaluation of this extremely variable species (Benda et al. 2015). The only method applicable to assess the phylogenetic relations in *P. kuhlii* is a molecular genetic analysis. The only available results of such analysis comprising the Egyptian and comparative samples (of a mitochondrial marker only) of this species were published by Benda et al. (2014b). The Egyptian samples of both morphotypes grouped with the European, Cypriot and other North African samples (of both morphotypes) into one common cluster, being separated from the samples of the Canary Islands and of the Middle East (Levant and Oman). This arrangement indicates the opinions regarding the North African and European populations as members of a common lineage representing a single taxon to be corroborated, while the Middle Eastern populations to be a part of a different lineage/taxon. Similar results were presented by Veith et al. (2011) and Bray et al. (2013), their analysis did not cover Egyptian samples though. So, when the intraspecific taxonomic division of *P. kuhlii* is finally suggested, the Egyptian populations should be most probably regarded as belonging to the nominotypical subspecies.

Vansonia rueppellii (Fischer, 1829)

RECORDS. Published data: E l B a h r E l A h m a r: Ras Shukeir [1], near ponds in the sewage farm, 2009: det. calls (Anonymous 2011). – E l F a y u m: Fayum [2], 1 ind. (Bonhote 1909); Faiyum, early in 1909: 1 ind. (Flower 1932). – E l J i z a h: Abu Rawash [3], January 1962: 1 ind. (Heyneman & Macy 1962); Abu Rawash, 1 ind. (Macy 1964); Abu Rawash, under rocks in desert hills, coll. inds. (Madkour 1977b); Abu Rawash (Madkour 1978); Abu Rawash, 1944: 1 m, 1 f, January 1957: 1 f, November 1959: 2 f, April 1967: 1 f, November 1967: 1 f, January 1968: 1 f, August 1968:

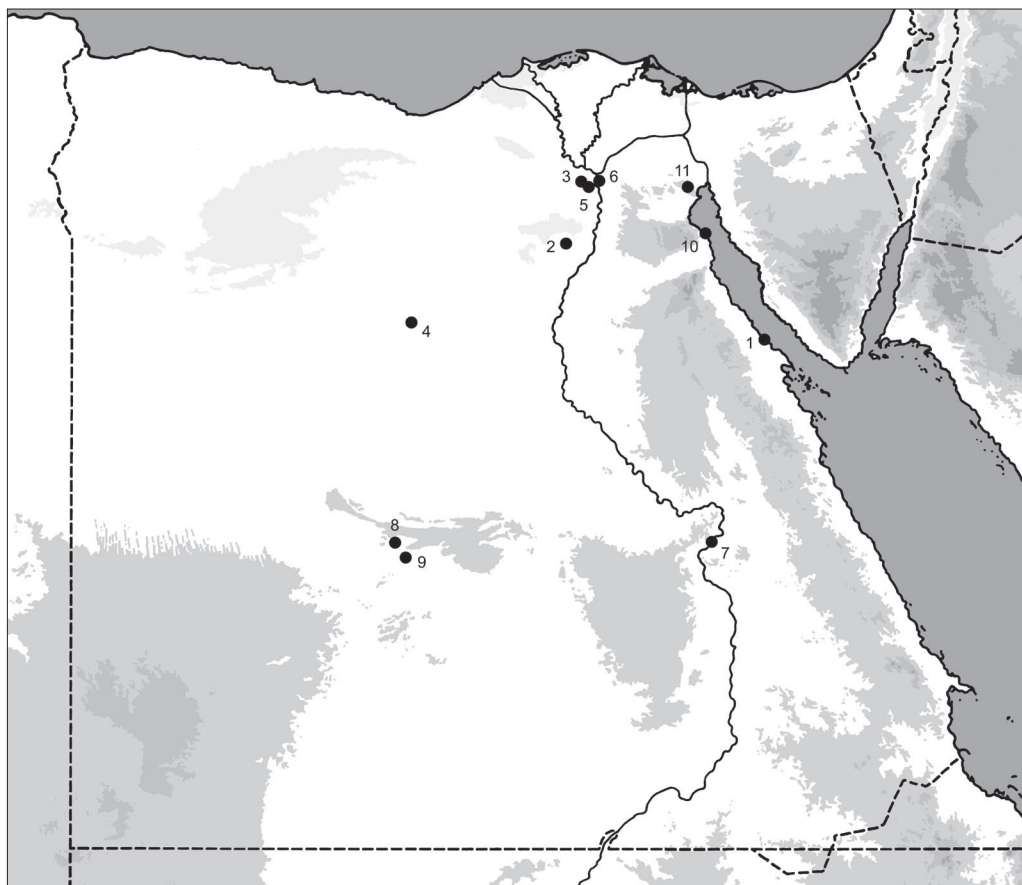


Fig. 27. Records of *Vansonia rueppellii* (Fischer, 1829) in Egypt; for explanations see Fig. 3.

1 f, ASUC (Wassif et al. 1984); Abu Rawash, 20 inds., FMNH, USNM (Qumsiyeh 1985); – Bahariya Oasis, Bawiti [4], above a lake, 17 October 2011: net. 11 ma, 21 fa, 1 mj, 6 fj, NMP, det. calls of several tens of inds. (Benda et al. 2014a, b, 2016a); – Giza [5], Kedah House, 11 August 1904: 1 m (Flower 1932). – El Qahira: Cairo area [6] (Hoogstraal 1962). – El Uqsur: Luxor [7], hotel, 1 m (Anderson 1902); Luxor (Sanborn & Hoogstraal 1955); Luxor (Hoogstraal 1962); Luxor, 1 ind., BMNH (Qumsiyeh 1985); Luxor, 1 m, BMNH (Benda et al. 2004a, 2014b). – El Wadi El Jadi: Dakhla Oasis, El Qasr [8], above a pool at medina, 22 January 2010: net. 1 ma, NMP, 25 March 2011: det. calls of & obs. ca. 10 inds., 30 March 2011: det. calls & obs. ca. 10 inds. (Benda et al. 2014a, b); El Qasr, at pools in the southern part of the village, 2 December 2010: det. calls & obs. 3 inds. (Benda et al. 2014a); El Qasr, at sewage water pools, 2 April 2011: net. 1 ma, 3 fa, NMP (Benda et al. 2014a, b); El Qasr, above a water pool near the eucalyptus stand, 28 February 2012: det. calls of ca. 5 inds. (Benda et al. 2014a); Dakhla Oasis, 1 ind., NMP (Karmáčková 2017); – Dakhla Oasis, Mut [9], above a lake, 15 October 2011: det. tens of inds. (Benda et al. 2014a). – Es Suis: Ras Abu Darag [10], 29° 22' N – 32° 35' E, Gulf of Suez, 12 October 1980: 1 fa, ZFMK (Nader & Kock 1983b); Ras Abu Daragh, Gulf von Suez, 12 October 1980: 1 f, ZFMK (Benda et al. 2014b); – Suez [11], 1 m, HZM (Hill & Harrison 1987); Ataka Mts. near Suez, coll. inds., HZM (Harrison & Makin 1988); Suez, 14 March 1982: 4 m, HZM (Bates et al. 2006).

IMPRECISE RECORDS. Egypt (Dobson 1878 [as *Vesperugo temminckii*]); Egypte (Trouessart 1879 [as *Vesperugo Temminckii*]); Egypte, 1 ind., RNHL (Jentink 1887 [as *Vesperugo temminckii*]); Ægyptus (Trouessart 1897); Egypten (Palacký 1901 [as

Vesperugo temminckii]; Ægyptus (Trouessart 1904); Egypt (Madkour 1976b); A. R. Egypt, inds. (Madkour 1977c); Egypt, 1 m, BMNH (Hill & Harrison 1987); Egypt, 2 inds. (Riad et al. 2000); Egypte, 1829: 1 ind., MNHN (Benda et al. 2004a, 2014b). – Nubien (Cretzschmar 1826 [as *Vespertilio Temminckii*]); Nubie (Temminck 1840 [as *Vespertilio temminckii*]); Nubien, 2 inds., SMF (Rüppell 1842b [as *Vespertilio Temminckii*]); Nubien (Hartmann 1863 [as *Vespertilio Temminckii*]); Nubien (Fitzinger & von Heuglin 1866, Fitzinger 1870d, von Heuglin 1877); Nubia (Dobson 1878 [as *Vesperugo temminckii*]); Nubie (Trouessart 1879 [as *Vesperugo Temminckii*]); Nubie, 1 ind., RNHL (Jentink 1887 [as *Vesperugo temminckii*]); Nubia (Trouessart 1897 [as *Vesperugo Temminckii*]); Nubia (Flower 1932).

DISTRIBUTION. *Vansonia rueppellii* is an uncommon bat species in Egypt, it has been found only in 11 sites (Fig. 27). Despite its scarce records, *V. rueppellii* is rather widespread over the country; it was found in four geographical regions of Egypt, where the record numbers are more or less balanced (Table 2). This bat was first recorded by Eduard Rüppell from the northern Sudan, near the present southern border of Egypt, in 1824 (Cretzschmar 1826). Along the Nile course of the Sudan, it is considered to be a common bat already for a long time (Flower 1932, Kock 1969, Koopman 1975), and to these records refer the old mentions of this bat occurrence in Nubia and/or Egypt (Temminck 1840, Rüppell 1842b, Hartmann 1863, Fitzinger 1870d, von Heuglin 1877, Dobson 1878, Trouessart 1879, 1897, 1904, Jentink 1887, Palacký 1901). However, from Egypt per se *V. rueppellii* was reported first at the end of the 19th century* from Luxor (Anderson 1902). In 1904, this bat was discovered in the Cairo Region (Flower 1932), while as late as in the 1980s it was found for the first at the Red Sea shore (Nader & Kock 1983b, Harrison & Makin 1988) and in the 2010s in two oases of the Western Desert (Benda et al. 2014a). Such situation is similar to the conditions in neighbouring countries, in the Levant *V. rueppellii* was first recorded in the 1980s (Harrison & Makin 1988), in Libya and Tunisia in the 2000s (Benda et al. 2004a, Dalhoumi et al. 2011). Nevertheless, just the numerous records from the Dakhla Oasis (Benda et al. 2014a) as well as the repeated records from Abu Rawash (Wassif et al. 1984) demonstrate that *V. rueppellii* could be locally abundant also in some of the few localities throughout the arid parts of Egypt.

The Egyptian records of *V. rueppellii* are available from a narrow altitude range of 8–345 m a. s. l. (median 76.0 m, mean 94.2 m; Fig. 4, Table 3).

The current picture of *V. rueppellii* distribution in Egypt does not conform fully to the view given by Qumsiyeh (1985). While in the Cairo Region and Nile Valley the number of localities has not changed, in the Red Sea shore and Western Desert, where no record was available to Qumsiyeh (1985), three and three records, respectively, are currently known.

The Egyptian distribution range of *V. rueppellii* is one of the limited projections from the sub-Saharan occurrence into the Sahara, similarly as in the Maghreb (Kowalski & Rzebik-Kowalska 1991, Aulagnier et al. 2017). Although this bat was also found as a rare inhabitant of the Levantine and Mesopotamian dry steppes (see Harrison & Bates 1991), its main distribution range covers the African savannahs from Senegal to South Africa (Happold 2013d, Monadjem et al. 2020). Due to the scarcity of the records of *V. rueppellii* across Egypt, it is not easy to state any direct continuation of the range other than to the Sudan in the south. Several records are known from the Rift Valley of Israel (Mendelssohn & Yom-Tov 1999) and the only closely situated distribution

* NOTE. We found a specimen of *Vansonia rueppellii* in the MNHN collection labelled to be collected by A. Lefèvre in Egypt in 1829 (see Benda et al. 2004a, 2014b), which perhaps represents the oldest Egyptian finding of this bat. However, there remains a possibility that the locality of the specimen lies out of the current territory of Egypt and it actually originates from the Sudan, an integral part of Egypt in the period 1821–1885. Unfortunately, we did not determine properly the collector of this specimen; Amédée Lefèvre (1798–1869) could be possibly identified as the right person – a physician and collector, who served in the Levant in 1828–1830. If he collected the bat personally, it could really originate from Egypt per se. Another specimen of *V. rueppellii* from Egypt was published by Jentink (1887) to be housed in the RNHL collection. However, this bat was reported to be a juvenile and erroneously labelled, it is thus in a need of relevant examination.

of *V. rueppellii* is known from continental Egypt. The Israeli occurrence is thus most probably another projection of the African range, although in Sinai this bat has not yet been documented. The only record of *V. rueppellii* from Libya was made in the oasis of Al Jaghub within a broader extent of the Siwa Basin, some 28 km west of the Egyptian border (Benda et al. 2004a). This record indicates a possible distribution of this bat also in the Siwa Oasis of Egypt.

TAXONOMY. *Vansonia rueppellii* was originally described by Cretzschmar (1826) as *Vespertilio Temminckii*, based on the series of seven specimens collected by Eduard Rüppell in Upper Nubia in 1824, during his first Afro-Arabian expedition, and sent to the SMF collection. Some of these original specimens were then sent to the RMHL collection (Temminck 1840, Jentink 1887, 1888). Cretzschmar (1826: 17) defined the locality of collection of the new species as follows: “Nubien. Rüppell hat 7 Exemplare in der Umgegend von Dongola gesammelt”. ‘Dongola, Sudan’†, was then mentioned broadly and until recently as the type locality of *Vespertilio Temminckii* Cretzschmar as well as of *Vespertilio Rüppellii* Fischer (Anderson 1902, Hollister 1918, Flower 1932, Allen 1939, Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Harrison 1964, Corbet 1978, Qumsiyeh 1985, 1996, Harrison & Makin 1988, Harrison & Bates 1991, Koopman 1993, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000, Benda et al. 2004a, Simmons 2005, Happold 2013d, Lanza et al. 2015, Burgin 2019b, Monadjem et al. 2020).

The SMF part of the type series of *Vespertilio Temminckii* Cretzschmar, two specimens of sex undetermined (SMF II.N.11.a, b), was first presented by Rüppell (1842b: 156), who mentioned its locality as ‘Nubien’. Mertens (1925), in his catalogue of mammal types in the SMF collection, reported the labelling of the lectotype (i.e., one of the bats reported by Rüppell 1842b) of *V. Temminckii* (and *V. Rüppellii*) as follows “Nr. [SMF] 4308 (alter Katalog: II.N.11.b). Shendi, Nubien. E. Rüppell S. G. 1824. Balg montiert, Schädel im Balg.” Besides the lectotype specimen (SMF 4308), Kock (1969) mentioned also the paralectotype (SMF 12385) to be labelled with the locality of ‘Shendi’. The labelling of the two SMF type specimens or only the lectotype showing them to come from Shendi, Sudan, was confirmed by additional examinations by Kock et al. (1972), Koopman (1975), Nader & Kock (1983b), and Benda et al. (2014b). In accordance with the ICZN (1999: Art. 76.2), the type locality of *Vespertilio Temminckii* Cretzschmar and of *Vespertilio Rüppellii* Fischer is the site of the geographical origin of the lectotype specimen, i.e., ‘Shendi, Nile Province, Sudan’ [16°41’08”N, 33°25’22”E], as already suggested by Koopman (1975). On the other hand, a part of the type series, two specimens still deposited in the RNHL collection, is really labelled to originate from Dongola (Jentink 1887, 1888, Koopman 1975). However, this fact does not affect the correction of the type locality (ICZN 1999). The whereabouts of the remaining three specimens of the original type series are unknown, their geographical origin thus cannot be revised.

Since the name *Vespertilio Temminckii* Cretzschmar, 1826 was found by Fischer (1829: 109) to be preoccupied by *Vespertilio Temminckii* Horsfield, 1824 (= *Scotophilus kuhlii* Leach, 1821), see Horsfield (1824: 70), Fischer created a substitute name for this species, *Vespertilio Rüppellii*. However, the unavailability of the Cretzschmar’s name remained overlooked for the whole 19th century, Anderson (1902: 127) was the first, who used the Fischer’s name regarding the Egyptian populations of *Vansonia rueppellii* per se. Moreover, Anderson correctly used an emended spelling of the species name, *rueppellii*, and this version of spelling was followed only by one of

† NOTE. This site name more likely denotes (today ruined) Old Dongola [Dungulah El Ajuz; 18°13’22”N, 30°44’47”E], since (New) Dongola [19°10’28”N, 30°28’26”E] as a town did not yet exist at the time of Rüppell’s travel, just as an Ottoman military camp, called El Urdi. Besides the latter name, Rüppell (1829) used also the name ‘Neu-Dongola’, but always in this expression, apparently to distinguish between this new settlement, [Old] Dongola, and the Dongola Province of Egypt (= northern territory of the Sudan appr. north of Berber).

the subsequent authors (Bonhote 1909), but omitted by others (Fitzinger & von Heuglin 1866, Fitzinger 1870d, von Heuglin 1877, Trouessart 1897, 1904, Hollister 1918, Flower 1932, Allen 1939, Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Hoogstraal 1962). Currently, the emended spelling (*ruep-*) is universally accepted and used (Kock 1969, Hayman & Hill 1971, Corbet 1978, Koopman 1975, 1993, 1994, Qumsiyeh 1985, Harrison & Makin 1988, Horáček et al. 2000, Simmons 2005, Happold 2013d, Lanza et al. 2015, Burgin 2019b, etc.), since it represents a ‘corrected subsequent spelling’ in accordance with the ICZN (1999: Art. 32.5.2.1).

Since the description of *V. rueppellii* was made on the material from the northern Sudan, the taxonomic affiliation of the Egyptian populations of this bat is not problematic, all involved authors assign them to the nominotypical subspecies (Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Hoogstraal 1962, Hayman & Hill 1971, Gaisler et al. 1972, Koopman 1975, 1994, Corbet 1978, Qumsiyeh 1985, Harrison & Makin 1988, Harrison & Bates 1991, Horáček et al. 2000, Happold 2013d, Lanza et al. 2015). Definitions of characters and geographical limits of particular subspecies within this species are uncertain (Hayman & Hill 1971, Koopman 1975, Burgin 2019b), they are reported to differ from each other by the size of body and skull and/or the tinge of pelage colouration. The distribution range of the nominotypical subspecies is reported to stretch from the Sudan to Egypt and the Levant (Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Hoogstraal 1962, Gaisler et al. 1972, Koopman 1975, Qumsiyeh 1985, Harrison & Bates 1991), or from the Sudan to Nigeria, Egypt and the Levant (Koopman 1994, Happold 2013d, Lanza et al. 2015), from Egypt to Algeria, Angola, Zimbabwe and the Sudan (Hayman & Hill 1971), or to cover the whole African range of the species (Corbet 1978). So, in short, the geographical variation in *V. rueppellii* is mostly unknown and remains to be studied (see Burgin 2019b). However, when a certain subspecific division of the species is to be suggested, the Egyptian populations will be included to the nominotypical form with most probability.

Nycticeinops schlieffenii (Peters, 1859)

RECORDS. Published data: El Q a h i r a h: Cairo [1], 1 ind., ZMB (Peters 1859); Cairo, 1 ind. (Allen 1914); Cairo, 1 m, ZMB (Turni & Kock 2008); Kairo, winter 1853–1854: 1 ind., ZMB (Germer 2020). – E s S u w a i s: Suez [2], 1 ind., SMF (Rüppell 1842b [as *Vespertilio Savii*?]); bei Suez (Fitzinger 1870c, von Heuglin 1877 [as *Vesperus Savii*]); Suez, 1832: 1 ind., SMF (Harrison 1961); Suez, 1 ind., SMF (Kock 1969).

IMPRECISE RECORDS. Aegypten (Hartmann 1868); Egypte (Trouessart 1879); Ægyptus (Trouessart 1897); Egypten (Palacký 1901); Ægyptus (Trouessart 1904).

COMMENTS. *Nycticeinops schlieffenii* is the rarest bat species of Egypt (Table 2), it is known only from two old museum specimens reported to originate in two localities in the northern part of the country (Fig. 28). These specimens were collected at the times of initial explorations of Egypt and north-eastern Africa as well, the Frankfurt Museum (SMF) specimen is given to be collected in Suez by Eduard Rüppell in 1832, and the Berlin Museum (ZMB) specimen in Cairo by Wilhelm von Schlieffen* (1829–1902) in the winter 1853–1854.

However, *N. schlieffenii* is a bat of the African savannahs, broadly distributed in the dry steppes and savannahs of sub-Saharan Africa and south-western Arabia, from Mauritania to the Sudan and Saudi Arabia, and to Natal and Namibia (Happold 2013c). The northernmost limits of its sub-Saharan range are found in the Sahel zone between Mauritania and the Sudan, at latitudes very

* NOTE. Turni & Kock (2008: 5) erroneously reported the ZMB specimen of *N. schlieffenii* to be collected by the Count Alfred von Schlieffen (1833–1913) in 1859. However, this younger cousin of Wilhelm von Schlieffen devoted his whole life to the military career (he served as one of the last chiefs of the General Staff of the German Empire before the WWI) and did not travel to the Orient. He is famous mainly for his invention of Schlieffen’s Plan, the strategy to defeat France at war.

similar to each other (Kock 1969). The known northern border connects the following record sites; M'hairat Oasis [20°17'N, 13°00'W], Adrar Mts., ca. 25 km SSE of Atar, Mauritania (Allegrini et al. 2011); Azzal, Asben [17°04'N, 08°03'E], ca. 10 km NE of Agadez, Niger (Thomas & Hinton 1921); Nakheila [17°24'N, 34°17'E], ca. 46 km SE of Atbara, Sudan (Schwann 1905); Port Sudan [19°37'N, 37°13'E], Sudan (Kock 1969); and Qanuna [19°06'N, 41°06'E], 3 km SE of Qunfida, Saudi Arabia (Harrison 1964). This line thus goes along the border between the ecoregions of the Sahara desert and South-Saharan steppes (Burgess et al. 2004). The two reported Egyptian localities of *N. schlieffenii* are extremely remote and isolated from this borderline of the continuous range of this species in sub-Saharan Africa. Cairo lies almost exactly 1,400 km (as the crow flies) north of the closest site at the Nile Valley in the northern Sudan (Nakheila) across the Sahara, while Suez is situated some 1,300 km northwards along the Red Sea shore from Port Sudan, the closest site of *N. schlieffenii* on the African Red Sea shore (see Kock 1969: 190, Abb. 19). Theoretically,

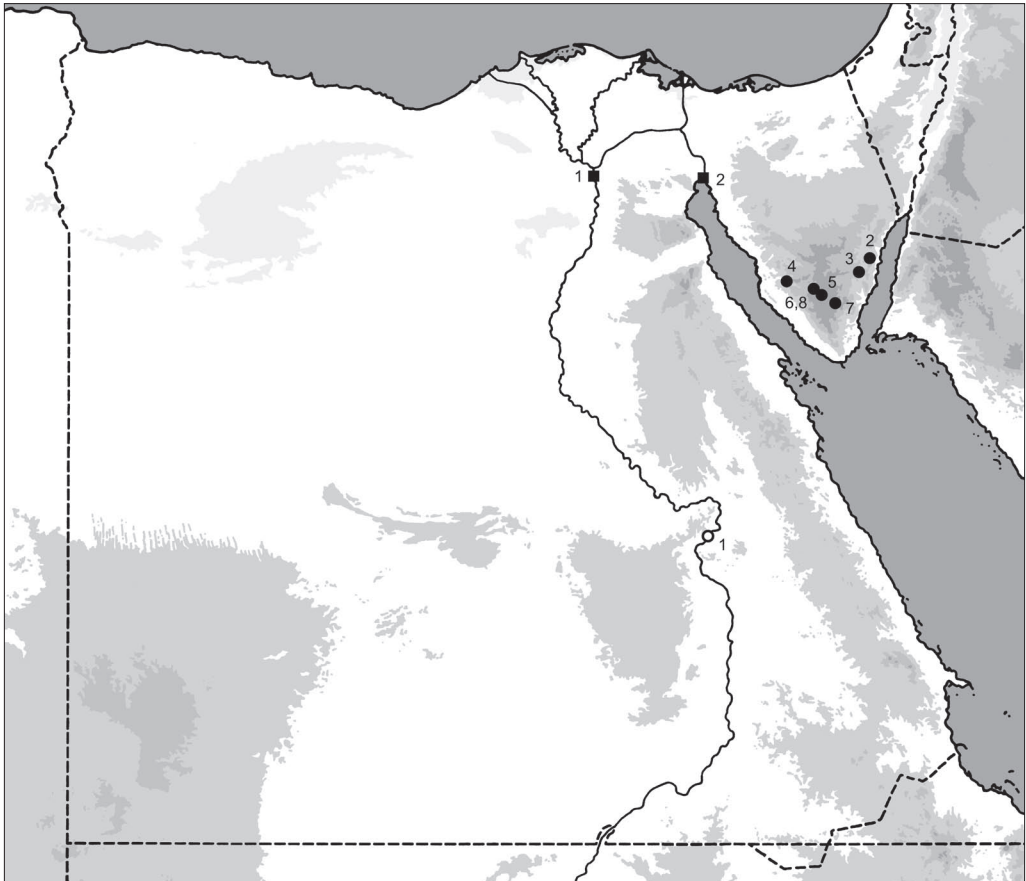


Fig. 28. Records of *Nycticeinops schlieffenii* (Peters, 1869) (squares) and *Barbastella leucomelas* (Cretzschmar, 1830) (circles) in Egypt; for explanations see Fig. 3. Open symbol denotes a record of uncertain species identification (for details see text).

such a type of distribution could be acceptable from the zoogeographical perspective, the broad geographical separation could be considered as a consequence of desertification of the Sahara, when an originally widespread species remained in refugia on the northern and southern margins of the desert. However, such a separation has no analogy in other African bat species of the dry savannahs, as they survived at least in the Nile Valley of Egypt and the Sudan, or in coastal areas of West Africa (see e.g., *Nycteris thebaica* and/or *Vansonia rueppellii*), and not only in the Cairo latitude of Egypt in the north and Sudanian Sahel in the south (considering their ranges in north-eastern Africa). Hence, the Egyptian range of *N. schlieffenii* is quite unusual comparing all other bats of Egypt and of Africa as well.

It is noteworthy that no record of *N. schlieffenii* has been reported from any country covering the northern or central parts of the Sahara north of 20°30'N (including Egypt) after 1854. Such striking absence of distribution data casts doubts on the real occurrence of *N. schlieffenii* in Egypt, this condition is incomparable to any other bat species of North Africa. Two possible explanations could be considered concerning this unusual case; (1) the data concerning the origin of the two reportedly Egyptian specimens of *N. schlieffenii* are erroneous in fact and their real origin is within the continuous sub-Saharan range of this bat; (2) the data concerning the two Egyptian specimens of *N. schlieffenii* are correct, the bats were really found in north-eastern Egypt, but the abundance of this bat in this northern separated range is very low and a possibility to meet any individual is almost zero (this means, the two elder explorers were extremely lucky), or alternatively, the Egyptian population has become extinct in the meantime (e.g., due to environmental changes in the concerned parts of Egypt).

Nevertheless, it is not an easy task to support the explanation (2) by an analogy from other bats of Egypt and/or surrounding countries. All bat species of Egypt – other than *N. schlieffenii* – that were documented from a very small number of individuals during the 19th century (i.e., *Eptesicus bottae*, *Vansonia rueppellii*, *Otonycteris hemprichii*, *Barbastella leucomelas*, *Tadarida teniotis*, and *Nyctinomus aegyptiacus*), were repeatedly recorded both from Egypt and adjacent countries during later periods, namely in the second half of the 20th century and also in the 21st century (see Qumsiyeh 1985, Mendelssohn & Yom-Tov 1999, Benda et al. 2008, 2010, 2014b, Aloufi et al. 2016). Additionally, although the urbanisation processes affected seriously the environment of the Cairo Region, the known species diversity of bats documented there is the highest among all geographical regions of Egypt, and the number of bat records is the second highest in this region (Table 2). Such high diversity and abundance of the bat fauna were demonstrated mainly in the 1950s and 1960s (see e.g., Sanborn & Hoogstraal 1955, Hoogstraal 1962, Wassif et al. 1984, Qumsiyeh 1985). However, no record of *N. schlieffenii* was made in this era of mass documentation of bats in northern Egypt (see also Introduction).

On the other hand, the possibility of incorrect labelling of the two reportedly Egyptian specimens of *N. schlieffenii* cannot be simply excluded. The older specimen (SMF 11956), labelled to originate from Suez, was published by Rüppell (1842b) as an alcohol preparation under an uncertain identification as *Vespertilio savii*?. Harrison (1961), who extracted skull from the specimen and revised the species identification as *N. schlieffenii*, also added 1832 as the year of specimen collection. Kock (1969) confirmed the revised identification and also Rüppell's authorship of the bat acquisition. This indicates that the bat was collected by E. Rüppell during his second African expedition to Abyssinia and the Red Sea region in 1830–1834 (Rüppell 1838, 1840; see also Klausewitz 2002 and Friis 2013). Although Rüppell passed the Suez area at least twice during this expedition, this did not happen in 1832, since he and his company spent the period between September 1831 and July 1833 in the areas now belonging to Eritrea and Ethiopia, collecting mainly the natural history items for the SMF collections. Moreover, during the voyage from Alexandria to Marseille, some of Rüppell's collections from Egypt were lost on a Russian ship that sank near

the French coast (Friis 2013), although theoretically, some small items of the collection (like e.g., a jar containing Egyptian bats or similar items) possibly survived this event on a different ship. Anyway, from this review it seems apparent that certain data concerning the SMF specimen of *N. schlieffenii* are doubtful. The bat either was not collected in Suez or was not collected in 1832 or was not obtained by Rüppell during his Abyssinia expedition. If the collector name and the year of collection were reported correctly, it is well possible that the SMF specimen was collected by Rüppell in the areas of low altitudes in the present day Eritrea or Ethiopia, where *N. schlieffenii* is not a rare bat (see Largen et al. 1974, Yalden et al. 1996, Kruskop et al. 2016, own unpubl. data), instead of Egypt, as Rüppell (1842b) reported a decade later.

The second Egyptian specimen of *N. schlieffenii* was published shortly after its acquisition to the ZMB by Peters (1859), who used it as a type (ZMB 585) for the description of a new species, *Nycticejus Schlieffenii*. The circumstances of collection of this specimen are given by Peters (1859: 223–224) as follows: “Hr. Graf Wilhelm von Schlieffen-Schlieffenberg hat unter anderen sehr werthvollen ägyptischen Naturalien auch eine kleine Fledermaus dem zoologischen Museum geschenkt, [...] // Das von Hrn. von Schlieffen in Cairo gefangene thier [...].” The date of collection was not mentioned, neither in any publication nor in the ZMB evidence (Turni & Kock 2008, H. Turni in litt.), only recently it has been given as the winter 1853–1854 by Germer (2020)*. The Count W. von Schlieffen was an explorer, who spent several periods in 1850–1855 in the Orient (Germer 2020). Although he collected some natural history material, he was interested mainly in egyptology. He travelled over northern Africa and the Levant, repeatedly stayed in Cairo and sent his collections to Berlin from there, including at least three shipments of zoological items (mainly birds) to the ZMB (Anonymous 2020, Germer 2020). He visited various parts of Egypt, in 1852 he travelled to Palestine, and between November 1852 and May 1853 he made a trip to Nubia and Kordofan in the present Sudan (Germer 2020).

In the ZMB, there currently remains a small series of eight bat specimens presented by von Schlieffen and labelled as originating from “Cairo, Aegypten” or “Aegypten” (H. Turni in litt., 2006). This series is composed of five species; six bats of three species belong to the common bat

* NOTE. Germer (2020) mentioned the winter 1853–1854 as the term of collection of the ZMB specimen of *Nycticeinops*, i.e., the period which von Schlieffen with his mother spent in Cairo on their third and last trip to Egypt. However, she did not support this mention by any indication, although it could theoretically exist, e.g., in the ZMB evidence. Again, Germer (2020) reported on a correspondence existing between Wilhelm H. Peters (1815–1883), a Berlin zoologist and descriptor of *N. schlieffenii*, and W. von Schlieffen. Since the only indication of their written contact exists in a letter sent by Karl R. Lepsius (1810–1884), a professor of egyptology from Berlin, to von Schlieffen staying in Cairo in 1854, Germer (2020) concluded that just this could concern the *Nycticeinops* specimen. In that case, the term of collection could really fall to the winter 1853–1854, or to early months of 1854. However, this remains just a speculation, as the new species was described by Peters five years later in a paper dealing with this and other ZMB bats originating from Egypt and the Sudan (Peters 1859). Germer (2020: 222) commented this story as follows: “Leider ist kein Schriftwechsel zwischen ihm [= W. Peters] und Graf von Schlieffen erhalten, Lepsius erwähnte allerdings in seiner Brief vom 5. 1. 1854 an den Kairo weilenden Grafen, dass Peters ein Schreiben beigelegt habe. Wir können deshalb nur vermuten, dass er darin Graf von Schlieffen bat, nach Fledermäusen Ausschau zu halten, da er über diese Thema, insbesondere die im Zoologischen Museum Berlin zur Verfügung stehenden Arten, gerade eine wissenschaftliche Abhandlung schrieb, die er 1859 veröffentlichte. Aus den Nilländern standen ihm dazu von den Naturforschern Rüppell, Ehrenberg und Hemprich aber auch Lepsius gefangene und präparierte Fledermäuse zur Verfügung. Graf von Schlieffen entsprach dem Wünsche Peters und schickte ihm in Kairo gefangene Exemplare, unter anderem eine winzige Glattrasen-Fledermaus. Im Vergleich zu ähnlichen Fledermäusen konnte Peters feststellen, dass es sich dabei um eine bisher noch nicht beschriebene Art handelte, die er dem Grafen zu Ehre mit dem Namen *Nycticeinops schlieffeni* [= *Nycticejus Schlieffenii*] versah.” If the concerned letter from Peters really contained a request for bats, this could support the assumption of a purchase of some bats by von Schlieffen in a natural product shop. It was perhaps the fastest way how to obtain a series of several bat species and fulfil the Peters’ request, since bats were and still remain an object of natural medicine in the Orient, along with e.g., lizards or scorpions (Dawson 1925, Riccucci 2012, own pers. observation).

fauna of the southern Levant and north-eastern Africa including Egypt (*Rhinopoma microphyllum*, *R. cystops*, *Taphozous perforatus*), while two species are currently unknown from Egypt, *Nycticeinops schlieffenii* and *Lavia frons* (Geoffroy, 1810). The latter species, similarly to *N. schlieffenii*, is an inhabitant of the savannahs of sub-Saharan Africa and its northernmost occurrence was evidenced from Khartoum, Sudan, where specimens were repeatedly collected (Dobson 1878, Jentink 1888); observations of *L. frons* are available from areas ca. 250 km north of Khartoum (Hartmann 1863, Anderson 1902), but their reliability was doubted by Happold (1967) and Kock (1969). Only one record was reported from Egypt and it was never accepted as correct; Jentink (1888: 170) mentioned a RNHL specimen of *L. frons* as follows: “Individu adulte monté. Egypte. Des collections de M. Rüppell.” Kock (1969: 111) refused this record with the following words: “Es handelt sich dabei um Material, welches aus der Sammlung Rüppell’s eingetauscht wurde und zweifellos ungenau etikettiert ist.” An identical problem is associated with the specimen of *L. frons* labelled “Aegypten” and given by von Schlieffen to the ZMB collection†. Hence, the von Schlieffen’s ZMB series of eight bats labelled “Aegypten” represents a mixture of specimens of (perhaps) Egyptian and (certainly) Sudanian origin, since all these species are known from the Sudan, but only three of them undoubtedly from Egypt. The reliability of the Egyptian origin of the type specimen of *N. schlieffenii* is then rather doubtful. The material collected by von Schlieffen in the Orient was probably gathered in various sites and transported to Cairo, and sent finally to the ZMB from there; perhaps this could cause a mislabelling of the specimens. Moreover, in the period 1821–1885, the Sudan was an integral part of Egypt and the collections coming from its Sudanese section could be labelled as coming from Egypt quite naturally. (The mislabelling of the Sudanese specimens with ‘Egypt’ is still sometimes in use, see e.g., Kitchener & Caputi (1985) concerning the BMNH specimens of *N. schlieffenii* from the Sudan.)

The last eventuality of a cause of the possible mislabelling of the two reportedly Egyptian specimens of *N. schlieffenii* is their actual provenance from a third side. Their origin could be in Egypt, but from a natural history merchant or natural healing dealer, who obtained the bats from another merchant bringing them from any site reachable by a caravan trade expedition. Although a majority of old records could be doubted in this way, since it is merely a speculation, the reliability of old records can be confirmed by new records from other authors. Anyway, this is not the case of *N. schlieffenii* in Egypt.

It is surprising that no author paid attention to these unclarities till now (see e.g., Qumsiyeh 1985, or Happold 2013c); on the contrary, Johnston (2006) even expected a connection between the localities of *N. schlieffenii* in northern Egypt and those in the north-eastern Sudan by a continuous range through mountains of eastern Egypt, but for this no real foundation exists, thus being an unsubstantiated speculation.

In conclusion, until the occurrence of *N. schlieffenii* in Egypt is confirmed by a new record, the position of this species as a member of the fauna of this country remains dubious. The Egyptian origin of two available specimens of this bat is here reasonably questioned, since in both cases their evidence contains clear ambiguities. The concerned specimens could be collected in the sub-Saharan range of *N. schlieffenii* and mislabelled as coming from Egypt. After all, several other bat species were erroneously reported to occur in Egypt due to mislabelling, like *Lavia*

† NOTE. Wilhelm von Schlieffen in his travel diary (Germer 2020: 220) mentioned a collection of a bat, “eine gelbe Fledermaus (*Rhinopoma microphyllum*)”, in a savannah country on the Nile bank between Insel Duhema [= Ed Dueim] and Tura el Chadra [= Et Tur’ah El Khadra] in the present White Nile State of the Sudan [~14°08’N, 32°14’E] on 19 February 1853. The locality and the description of the specimen (yellow bat) indicates a collection of *Lavia frons* rather than of *Rhinopoma* sp. This field note could correspond with the ZMB specimen of *L. frons* labelled ‘Aegypten’ presented by von Schlieffen.

frons or *Chaerephon major* (Trouessart, 1897), see e.g., de Winton (1901a), Kock (1969), and Qumsiyeh (1985).

Otonycteris hemprichii Peters, 1859

RECORDS. Published data: Aswan / Esh Shimaliyah: “aus der Sammlung der Hrn. Hemprich und Ehrenberg” [= north-eastern Africa and the Levant], 2 inds., ZMB (Peters 1859); Aegypten (?) (Hartmann 1868); Afrique Nord-Est (Trouessart 1879); Afrique nord-est, 1 ind., ZMB (Lataste 1885); Lower Nubia (Flower 1932); Egypte, 1 ind. (Heim de Balsac 1937); Hemprich and Ehrenberg’s collecting (Allen 1939); probably from some part of North-Eastern Africa (Ellerman & Morrison-Scott 1951, 1966); [north of or at] Syene (= Assuan) [1], before 10 November 1821: 2 inds., ZMB (Stresemann 1954); Nil-Tal in Oberägypten oder Nord-Sudan, zw. nördlich von Assuan bis Chondek, September 1821 to 21 July 1822: 2 inds., ZMB (Kock 1969); the Nile Valley between Assuan in Egypt and Northern Province, Sudan (Koopman 1975); Nile Valley south of Assuan (Aswan), Egypt (Koopman 1993); the Nile valley between north of Assuan, Egypt, and Chondek, south of Dongola, Sudan, between September 1821 and 21 July 1822: 2 inds., ZMB (Benda et al. 2006); Egypt, between September 1821 and 21 July 1822: 2 inds., ZMB (Turni & Kock 2008); Ägypten [= the Nile valley between Aswan, Egypt, and Khondek, Sudan], [between September 1821 and 21 July 1822], 2 inds., ZMB (Benda & Gvoždík 2010). – El Bahari El Ahmar: Koseir [2], July: coll. 1 ind. (Klunzinger 1878). – El Beheira: Western Desert (Wadi Natroun) [3] (Sanborn & Hoogstraal 1955); Wadi El Natrun, 1 ind., FMNH (Qumsiyeh 1985); Wadi El Natrun (Wassif 1995). – El Faiyum: Faiyum [4] (Sanborn & Hoogstraal 1955); El Fayoum (Baruś 1973); Fayum, 25 July 1971: 1 m, WICA (Nader & Kock 1983b); El Faiyum (Wassif 1995); El Fayum, 25 July 1971: 4 fa, NMP (Benda et al. 2006, 2008, Benda & Gvoždík 2010); – Kom Oshim [5], 1–2 inds. (Hoogstraal 1952); Kom-Oshim, August 1951: coll. 2 m, 4 f, October 1951: coll. 2 m, 1 f (Wassif 1953); Kom Oshim, 7 inds., USNM (Qumsiyeh 1985). – El Jizah: Aburoash [6], 6 October 1903: 2 inds., 9 October 1903: 1 m, 9 October 1920: 1 ind. (Flower 1932); Abu Rawash, September 1945: coll. 1 f, October 1945: coll. 1 m, September 1946: coll. 2 f, September 1947: coll. 2 m, 1 f, May 1948: coll. 1 m, May 1951: coll. 1 m, 3 f, August 1952: coll. 2 m, September 1952: coll. 3 f (Wassif 1953); Abu Rawash, tombs, inds. (Heyneman & Macy 1962); Abu Rawash, cave (Wassif 1962); Abu-rawash, 45 inds. (Rifaat et al. 1967); Abu Rawash (Baruś 1973); Abu Rawash, 28 September 1945: 1 ind. (Haas & Tomich 1973); Abu Rawash (Madkour 1978); Abu Rawash, 19 July 1977: 1 f, WICA (Nader & Kock 1983b); Abu Rawash, September 1947: 1 m, 1 f, August 1956: 1 m, June 1966: 6 f, July 1966: 3 m, 6 f, July 1967: 1 m, August 1967: 3 m, 6 f, May 1968: 1 m, 2 f, July 1968: 1 f, June 1969: 1 m, 5 f, August 1969: 1 m, ASUC (Wassif et al. 1984); Abu Rawash, 66 inds., FMNH, HZM, USNM (Qumsiyeh 1985); Abu Rawash, coll. inds. (Ramadan 1986); Abu Rawash (Wassif 1995); Abu Rawash, 19 July & 18 October 1971: 1 fa, 2 inds., NMP (Benda et al. 2006, 2008, Benda & Gvoždík 2010); – Abusir [7], tombs of Abusir South, 3 inds. (Pokorný et al. 2009); Abusir, tomb of Kakaiabef, 2013: 1 ind. (Šúvová & Krejčí 2015, Dulíková et al. 2018); Abusir, mastaba of Nyankhsheshat, 2018: 2 inds. (Odner et al. 2019); – El Aiyat [8], 6 inds., USNM (Qumsiyeh 1985); – El Mansuriya [9], 1 ind., USNM (Qumsiyeh 1985); – Giza [10] (Sanborn & Hoogstraal 1955, Hoogstraal 1957); Giza nr. Cairo, April 1971: 1 m, SMF (Nader & Kock 1983b); Giza, 2 inds., May 1948: 1 ind., August 1966: 1 f, ASUC (Wassif et al. 1984); Giza, 7 inds., BMNH, FMNH, USNM (Qumsiyeh 1985); Giza, Great Pyramid of Giza, 1 ind., USNM (Ziegler et al. 2016); – Imbaba [11], Abu Rawash, 10 June 1953: 1 m, 4 f, FMNH (Nader & Kock 1983b); Imbaba, Abu Rawash, 23 September 1966: 1 ind., YPM (Dornburg et al. 2011); – Sakkara [12], 1–2 inds. (Hoogstraal 1952); Sakkarah, September 1950: coll. 1 f (Wassif 1953); Sakkara, tombs, inds. (Heyneman & Macy 1962); Sakkara, 1972–1975 (Saoud & Ramadan 1977a); Sakkara, 29 May 1951: 1 f, FMNH (Nader & Kock 1983b); Sakkara, January 1966: 1 f, June 1966: 1 m, 4 f, ASUC (Wassif et al. 1984); Saqqara, 3 inds., FMNH (Qumsiyeh 1985); Sakkara, coll. inds. (Ramadan 1986); Saqqara (Wassif 1995). – El Qahirah: [Cairo,] Abbasia [13], October 1956: 1 f, ASUC (Wassif et al. 1984); – Cairo Area [14] (Hoogstraal 1952); bei Kairo, 1 ind., SMF (Kock 1969); Cairo, 1 ind., NHMB (Qumsiyeh 1985); nr. Cairo, 1959: 1 m, SMF (Benda et al. 2006, Benda & Gvoždík 2010); – Eastern Desert (20 miles east of Kairo) [15] (Sanborn & Hoogstraal 1955); 20 miles east of Cairo, 1 ind., FMNH (Qumsiyeh 1985); – Tura [16], 5 inds., FMNH (Qumsiyeh 1985). – El Uqsu: El Uksur (Luxor) [17], El Karnak Temple, 28 January 2010: coll. 1 ind. from *Tyto alba* pellets, NMP (Benda & Gvoždík 2010, Benda et al. 2014a). – El Wadi El Jaidi: Kharga Oasis [18], Christian crypts “City of Dead”, deep crevices of the earthen walls, 6 May 1969: 2 ma, IVB (Gaisler et al. 1972); Kharga Oasis (Madkour 1978); Kharga Oasis, 6 May 1969: 2 m, IVB (Benda et al. 2006, Benda & Gvoždík 2010). – Janub Sinat: Feiran [19], above a pool, 8 September 2005: net. 1 fa, NMP (Benda et al. 2006, 2008); Feiran, garden, 10 September 2005: net. 1 ma, NMP (Benda et al. 2006, 2008); Wadi Feiran, Sinai, 8 & 10 September 2005: 1 m, 1 f, NMP (Benda & Gvoždík 2010); – Wadi El Braga camp [20], 10 July 2007: net. 3 ma (Truscott 2007); Wadi Sulaf, Wadi El Braga Camp, 10 July 2007: net. 3 ma (Benda et al. 2008); – Wadi Nasb [21], Mousa’s Garden, 29 June 2006: net. 1 ma, 22 July 2006: net. 1 ma (Benda et al. 2008). – Matruh: Libyan Desert (west of Alexandria) [22] (Anderson 1902); Libyan desert W. of Alexandria, 1 ind., USNM (Qumsiyeh 1985); – Oasis of Siwah [23], 3 f (Anderson 1902); Oasis Suvah, 2 f, BMNH (Kitchener & Caputi 1985); Siwa, 3 inds., BMNH (Qumsiyeh 1985); Siwa Oasis (Wassif 1995); Siwa Oasis, 2 f, BMNH (Benda & Gvoždík 2010). – Shamal Sinat:

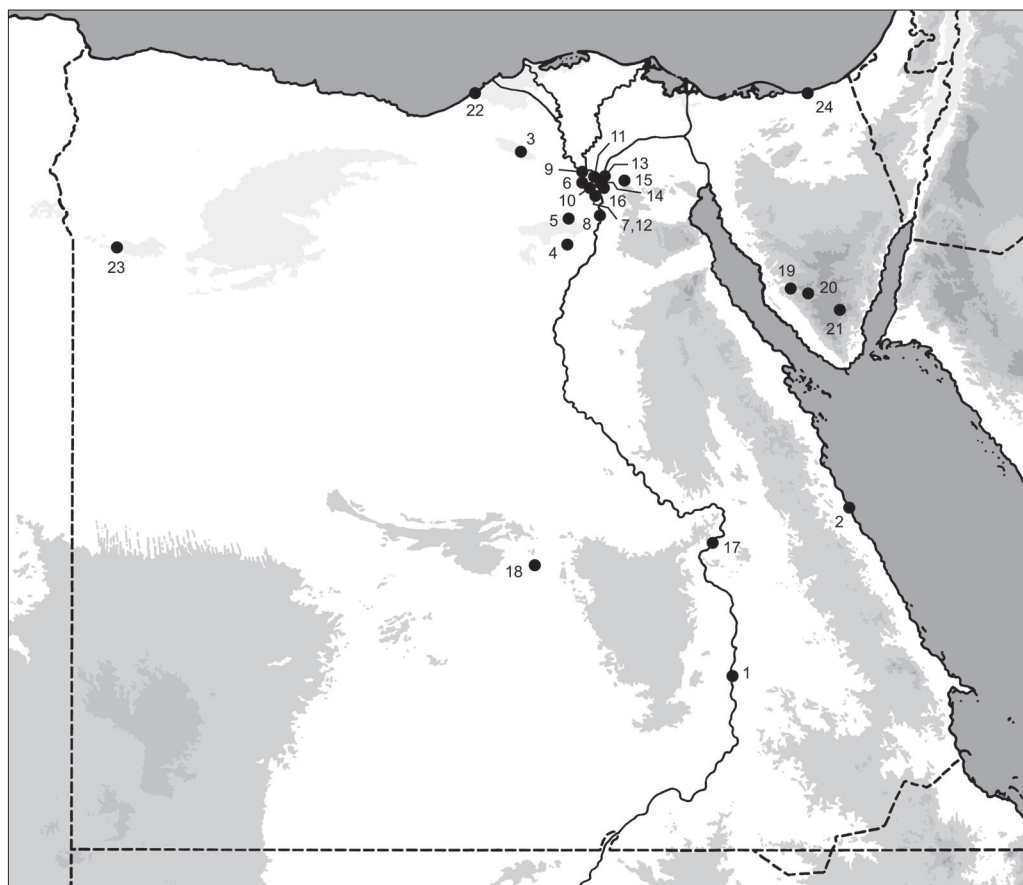


Fig. 29. Records of *Otonycteris hemprichii* Peters, 1859 in Egypt; for explanations see Fig. 3.

El-Arish [24], old building, August 1944: coll. 1 m (Wassif 1953); El Arish, 9 August 1944: 1 m, ASUC (Harrison 1964); El-Arish, August 1944: 1 m, ASUC (Wassif et al. 1984); El Arish (Wassif 1995).

IMPRECISE RECORDS. *Ægyptus* (Trouessart 1904); Egypt (Hoogstraal 1955, 1956); Egypt, 1 ind. (Wells & Randall 1956); Egypt (Myers et al. 1962); Egypt, coll. inds. (El Sabban et al. 1967); Egypt, inds. (Madkour 1976b); Egypt, 1972–1975: 6 inds. (Saoud & Ramadan 1976b, 1977d); A. R. Egypt, inds. (Madkour 1977c); Egypt, 1 ind. (Horáček et al. 2006). – Nubia (Trouessart 1897 [as *Plecotus ustus*]); Nubien (Palacký 1901 [as *Plecotus ustus*]); Nubia (Trouessart 1904 [as *Plecotus ustus*]). – Lower Nubia (Flower 1932). – vicinity of Cairo [13–16] and Giza [6–12] Province, October 1959 – October 1961: 3 inds. (Mohammed & Saoud 1965).

DISTRIBUTION. *Otonycteris hemprichii* is a medium-frequent bat species in Egypt, it has been found in 24 sites (Fig. 29; Table 2). With the exception of the Nile Delta, it was documented in all geographical regions of the country, in the Cairo Region it ranks among the most common bats. All records of *O. hemprichii* come from the arid parts of Egypt, two localities from near the Mediterranean Sea shore are also situated in desert areas. The sites in the Nile Valley, though scarce, are available from its whole length in Egypt. Three records are known from three oases of

the Western Desert (Siwa, Wadi El Natrun, Kharga), despite an intensive research, *O. hemprichii* was not documented from the Dakhla Oasis (Benda et al. 2014a).

The Egyptian records of *O. hemprichii* are available from a rather wide altitude range of –10–1260 m a. s. l. (median 45.0 m, mean 189.0 m; Fig. 4, Table 3). While the localities in the continental African part of Egypt lie in a narrow range of altitudes (–10–263 m a. s. l.; median 29.5 m, mean 51.7 m), the Sinaitic localities come from a rather wide altitude range of 16–1260 m a. s. l. (median 715.0 m, mean 738.2 m; Fig. 5, Table 4). Although the continental and Sinaitic altitude ranges largely overlap, they represent different distribution types; while *O. hemprichii* occurs in lowland and submontane altitudes in the continent, it lives mostly in medium-high mountains in Sinai.

Only two very old records of *O. hemprichii* are known from Nubia, of them only one is precisely localised. One individual was collected by Theodor von Heuglin (1824–1876) south of Wadi Halfa, in the region of Batn El Hajar in the northernmost Sudan, most probably in the early 1860s (Fitzinger & von Heuglin 1866, von Heuglin 1877). Another record of *O. hemprichii* that is not localised accurately was made earlier, by Friedrich W. Hemprich (1796–1825) and Christian G. Ehrenberg (1795–1876), during their expedition to north-eastern Africa and the Levant in 1820–1826, and the two respective specimens represent syntypes of the species description (Peters 1859). The origin of these specimens was not localised either in the description or on their labels (see below). About a century after the species description, Stresemann (1954) suggested to specify the origin of the syntype specimens of *O. hemprichii* to the area north of Aswan, while Kock (1969) proposed to place the type locality to the Nile Valley between north of Aswan, Egypt, and Khondek, south of Dongola, Sudan. The latter localisation covers some 870 km of the Nile course, about one third of this length is situated to Egyptian Nubia. Aswan, as the site where both conceptions meet and also as the northern margin of the extensive locality of possible collection suggested by Kock (1969), is marked in the map of *O. hemprichii* distribution in Egypt (Fig. 29).

The current picture of *O. hemprichii* distribution in Egypt conforms generally to the view given by Qumsiyeh (1985), with the exception of the occurrence area in southern Sinai, discovered in 2005 (Benda et al. 2008). Only in some other regions the numbers of records have increased slightly in comparison to those reported by Qumsiyeh (1985), namely in the Cairo Region and Nile Valley.

The Egyptian distribution range of *O. hemprichii* is a part of the arid belt of occurrence covering the Sahara, most of Arabia, Mesopotamia, and southern Iran (Benda & Gvoždík 2010). While in the south of Egypt, the species distribution reaches its margins, as the southernmost localised record is available from the Sudanese Nubia at the Egyptian border, in the west and east, the occurrence continues to arid habitats of Libya and Arabia (Mendelssohn & Yom-Tov 1999, Benda et al. 2006, 2014b, Aloufi et al. 2016).

TAXONOMY. As mentioned above, *Otonycteris hemprichii* as a species was described by Peters (1859) based on two ZMB specimens collected by F. W. Hemprich and C. G. Ehrenberg during their expedition to the Orient in the 1820s, they originally labelled them as ‘*Vespertilio aurito* aff.’ (Stresemann 1954). Concerning the origin of these syntype specimens, Peters (1859: 223), an author of the description, did not give any geographical data and just mentioned as follows: “Zwei Exemplare dieser neuen Gattung befinden sich im zoologischen Museum, welche aus der Sammlung der Hrn. Hemprich und Ehrenberg stammen sollen”. Since these specimens did not bear any geographical data on the origin on their labels, the type locality of *O. hemprichii* was placed to ‘Egypt’ (Hartmann 1868, Heim de Balsac 1937, Allen 1939, Atallah 1977) or to ‘north-eastern Africa’ (Trouessart 1879, Lataste 1885, Ellerman & Morrison-Scott 1951, 1966, Sanborn & Hoogstraal 1955, Harrison 1964, Corbet 1978). Stresemann (1954: 47, 172), who gathered

and published evidence of the Hemprich's & Ehrenberg's Expedition, suggested to specify the locality of collection of the syntypes to the area of Upper Egypt north of Aswan and the time to before 10 November 1821. Based on a detailed examination of the ZMB evidence as well as the Hemprich's & Ehrenberg's Expedition itinerary (cf. Stresemann 1954), Kock (1969: 184) restricted the area of origin of the syntype specimens of *O. hemprichii* most precisely as follows: "Nil-Tal in Oberägypten oder Nord-Sudan (zw. nördlich von Assuan [24°05'N, 32°54'E] bis Chondek [18°36'N, 30°34'E])", and the time of collection to the period between September 1821 and 21 July 1822. This type locality specification was almost universally accepted as justified (Koopman 1975, 1993, Qumsiyeh 1985, Harrison & Bates 1991, Corbet & Hill 1992, Bates & Harrison 1997, Mendelssohn & Yom-Tov 1999, Simmons 2005, Benda et al. 2006, Turni & Kock 2008, Benda & Gvoždík 2010, Horáček 2013, Burgin 2019e). Qumsiyeh (1996) defined the type locality in a slightly obscure variation (although with a reference to Kock 1969), see as follows: "the Nile Valley between Dandara, Egypt and Chondek, Wadi Halfa, Sudan".

Concerning the Egyptian populations of *O. hemprichii*, another name appeared within its synonymy, *Plecotus ustus*. This name was originally created by Fitzinger & von Heuglin (1866: 546) and assigned to a specimen collected by T. von Heuglin in the region of Batn El Hajar near Wadi Halfa [ca. 21°33'N, 31°05'E] in northern Sudanese Nubia (see above); however, he did not complement this name by a description of the new species and thus, the name *Plecotus ustus* Fitzinger et von Heuglin represents a nomen nudum. Formally, this name was created as available by von Heuglin (1877: 30), who supplied this name by a very detailed description. This moment was appreciated by Dobson (1880: 183), who, however, added as follows: "*Plecotus ustus*, Heuglin, is re-described [...], but whether that (?) species really belongs to the genus *Plecotus* or not I am quite unable to judge from the description, which omits all reference to the dental characters." The problem was elucidated by Anderson (1902), who reported that the type specimen of *P. ustus*, kept in the NMW collection, was re-identified as *O. hemprichii* by Ludwig Lorenz von Liburnau (1856–1943) from the NMW, and thus, indicated that *Plecotus ustus* von Heuglin represents a junior synonym of *Otonycteris hemprichii* Peters. The real identity of the type specimen of *P. ustus* was confirmed by Koopman (1975), Horáček (1991), and Benda & Gvoždík (2010), who examined again the type specimen. Although the type locality of *Plecotus ustus* lies actually in the Sudan, on these grounds several authors (Trouessart 1897, 1904, Palacký 1901) reported Nubia [s.l.] as a part of the distribution range of (de facto) *O. hemprichii*. Additionally, Flower (1932) mentioned Lower Nubia, i.e., the Egyptian part of this country, as an occurrence area of *O. hemprichii*, apparently based on the misinterpretation of the von Heuglin's record.

The taxonomic affiliation of the Egyptian populations of *O. hemprichii* seems to be clear, since the species is described on the basis of material from the Nile Valley of the Egyptian-Sudanese transition. Nevertheless, while the populations of the species from the African continent including Egypt were naturally affiliated to the nominotypical subspecies by all involved authors, the bats from Sinai were originally assigned to an Arabian subspecies, *O. hemprichii jin* Cheesman et Hinton, 1924 (Wassif 1953), and this taxonomic opinion was broadly accepted for the Sinaitic and Levantine populations (Harrison 1964, Atallah 1977, Corbet 1978, Qumsiyeh 1985, 1996, Harrison & Bates 1991, Mendelssohn & Yom-Tov 1999). The latter form was described originally as a separate species, *O. jin*, from Hufuf, Saudi Arabia [25°23'N, 49°35'E], some 1500 km east of the Levant, on the basis of the large body size, pale colouration of the pelage, and rather inflated tympanic bullae in the type specimens (Cheesman & Hinton 1924); however, no author really compared these characters within the Arabian, Sinaitic and Egyptian populations to state them valid for taxonomic division of the populations of the Afro-Arabian transition. On the other hand, several other authors considered the Sinaitic and/or Levantine populations to pertain to the same taxon as the bats from Egypt and North Africa as well, i.e., to *O. h. hemprichii* (Ellerman

& Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Hoogstraal 1962, Hayman & Hill 1971, Gaisler et al. 1972).

Kock (1969) and Nader & Kock (1983b) did not find any sign of geographic variation in *O. hemprichii* that could substantiate definition of subspecies within the whole distribution range between the Maghreb and Kashmir, and this opinion was tentatively adopted also by Corbet (1978). Horáček (1991) first carried out a partial analysis of geographical variation in *O. hemprichii* and found an evidence of cline variations in metrical characters and in pelage colouration, but did not reveal step differences between local populations to justify their separation into subspecies. This conclusion was adopted and later presented also by Horáček et al. (2000) and Simmons (2005).

Benda & Gvoždík (2010) evaluated the geographical variation within *O. hemprichii* using molecular genetic and detailed morphological analyses. The North African, Levantine and Mesopotamian populations, including Egyptian continental and Sinaitic samples, were shown to be a part of an identical phylogenetic lineage that represents the nominotypical subspecies. In comparison with other populations of the genus they are characterised by small body size, very pale (or even white) pelage colouration, a relatively wide and short rostrum, a relatively wide braincase, relatively large tympanic bullae, relatively high coronoid processes of the mandible, and a rather small and robust baculum. This form has the largest distribution range among all taxa of *Otonycteris* Peters, 1859, other forms of this genus occur in the eastern parts of the range; *O. h. jin* and *O. h. cinerea* Satunin, 1910 in eastern Arabia and Iran, and a separate species *O. leucophaea* (Severcov, 1873) in West Turkestan, Afghanistan, and Kashmir. This taxonomic arrangement was accepted by Horáček (2013) and Burgin (2019e).

***Barbastella leucomelas* (Cretzschmar, 1830)**

RECORDS. Published data: E l U q s u r: W Egyptě we kryptách thebských [= In Egypt, in the crypts of Thebes] [1] (Presl 1834 [as *Plecotus barbastellus*]). – J a n u b S i n a': Ain El Furtaga [2], a canyon above the oasis, 15 September 2005: det. & rec. 1–2 inds. (Benda et al. 2008); – Ain Hudra [3], oasis, 14 September 2005: net. 1 ma, NMP, 15 September 2005: net. 1 ma, NMP, det. & rec. 1–2 inds. (Benda et al. 2008, Kruskop 2015, Kruskop et al. 2019); – Feiran [4], garden, 9 September 2005: det. & rec. 1 ind. (Benda et al. 2008); – Wadi Arbain [5], Saint Katherine Research Centre, 29 July 2005: obs. & rec. 5 inds., 30 July 2005: net. 2 fa, obs. & rec. about 20 inds., 2 August 2005: obs. & rec. about 20 inds., 9 August 2005: obs. & rec. about 10 inds. (Dietz 2005b, Dietz & Maltby 2006); St. Katrina village & surroundings, at the St Katherine Protectorate Centre, 8 July 2007: net. 1 ma & det. & rec. calls (Truscott 2007); El Milga, St. Katherine Research Centre, 29 July 2005: obs., det. & rec. 5 inds., 30 July 2005: net. 2 fa, CDIS, det. & rec. min. 20 inds., 2 August 2005: obs., det. & rec. min. 20 inds., 9 August 2005: obs., det. & rec. min. 10 inds., 8 July 2007: net. 1 ma, det. & rec. min. 5–6 inds. (Benda et al. 2008, cf. Mayer et al. 2007, Zhang et al. 2007); – Wadi Gharaba [6], 12 July 2011: net. 1 ind. (Foui 2011); – Wadi Nasb [7], village, 28 July 2011: net. 2 inds. (Foui 2011); – Wadi Sheikh awad [8], Ecolodge Al-Karm, 17 August 2005: rec. 1–2 inds. (Dietz 2005b, Dietz & Maltby 2006); Sheikh Awad, El Karm Ecolodge, 17 August 2005: det. & rec. 1–2 inds. (Benda et al. 2008).

IMPRECISE RECORDS. Das petraeische Arabien, alte verödete Wohnungen (Cretzschmar 1830); Arabie pétée (Temminck 1840); peträische Arabien (Wagner 1840); Arabien, 2 inds., SMF (Rüppell 1842b); Peträische Arabien (von Heuglin 1861b); Arabia petraea (Hartmann 1868); peträischen Arabien (Fitzinger 1872); Arabie pétée, 1 ind., RNHL (Jentink 1887 [as *Synotus barbastellus*]); Arabie pétée, 2 inds., RNHL (Jentink 1888 [as *Synotus barbastellus*]); Arabia Petraea (Trouessart 1897 [as *Synotus barbastellus*]); Arabia Petraea (Trouessart 1904 [as *B. barbastellus*]); Arabia petraea, 1 ind., SMF (Mertens 1925); Arabia Petraea (Allen 1939 [as *B. barbastellus*]); Arabia Petraea (= Sinai) (Ellerman & Morrison-Scott 1951, 1966); Sinai, 1827: 1 ind., SMF (Harrison 1964); Arabia Petraea (= Sinai), 2 inds., SMF (Kock 1969 [as *B. barbastellus*]); Sinai, 2 inds., SMF (Harrison & Makin 1988); 'the area of the Sinaitic peninsula to the south of the connecting line between the towns of Suez and Aqaba', 2 inds., SMF (Benda et al. 2008).

DISTRIBUTION. *Barbastella leucomelas* is a rare bat species in Egypt, it has been reported only from eight to nine localities (Fig. 28; Table 2). With the exception of one dubious record, all sites are known from the mountainous southern part of Sinai, from the area where the type series of this species was collected by Eduard Rüppell in the period 1822–1826 (Flower 1932, Harrison 1964,

Benda et al. 2008). In southern Sinai, *B. leucomelas* represents a medium-frequently documented bat species, according to the number of records it is the third most common bat (Table 2; cf. Benda et al. 2008, Foui 2011); the localities are spread over a wide altitude range of 240–1590 m a. s. l. (median 1160.0 m, mean 1048.1 m; Fig. 5; Table 4).

Until 2005, only one locality of *B. leucomelas* was available from Egypt (see Qumsiyeh 1985), i.e., that of the type series composed of at least four specimens, now housed in the RNHL and SMF collections (see Temminck 1840, Rüppell 1842b, Jentink 1887, 1888, Mertens 1925, Kock 1969). It was reported from ‘Arabia Petraea’ by the author of description (Cretzschmar 1830), and this specification was followed by numerous authors (Temminck 1840, Wagner 1840, von Heuglin 1861b, Fitzinger & von Heuglin 1866, Fitzinger 1872, Hartmann 1868, Dobson 1878, Jentink 1887, 1888, Trouessart 1897, 1904, Palacký 1902, Bianki 1917, Mertens 1925, Allen 1939, Tate 1942, Lay 1967), while the collector himself (Rüppell 1842b: 156) stated only ‘Arabia’ as the locality of collection of the type specimens. Flower (1932) suggested to restrict the type locality of *B. leucomelas* to ‘Sinai’ and this opinion was accepted by most of the subsequent authors (about 35 papers, see the review by Benda et al. 2008: 51; and concerning the Egyptian fauna namely: Sanborn & Hoogstraal 1955, Harrison 1956, 1964, Hoogstraal 1962, Kock 1969, Makin 1977, Qumsiyeh 1985, 1996, Harrison & Makin 1988, Harrison & Bates 1991, Qumsiyeh et al. 1998, Mendelssohn & Yom-Tov 1999, Ferguson 2002, Mayer et al. 2007). Harrison (1964) studied the published evidence concerning the collection of the bats by E. Rüppell in detail and stated the type locality as ‘Sinai’ again; he thus confirmed the opinion by Flower (1932), Ellerman & Morisson-Scott (1951), and others. Benda et al. (2008) tried to specify the type locality of *B. leucomelas* more precisely; based on the description of the expedition route by Rüppell (1829) and the accompanying maps, they suggested to restrict the site of origin of the type series as ‘the area of the Sinaitic peninsula to the south of the connecting line between the towns of Suez and Aqaba’ (Benda et al. 2008: 53). This mountainous triangular territory that roughly conforms with the delimitation of the Janub Sina’ Governorate is also the area from which all other Sinaitic records of *B. leucomelas* came. These individuals thus could be considered as ‘topo-type specimens’.

Besides the series of Sinaitic records of *B. leucomelas*, another report from Egypt could be formally assigned to this species, although it remains completely obscure. In his handbook of mammals of the world, Presl (1834) mentioned the species *Plecotus barbastellus* with the distribution covering also Egypt*, where it lives “in the crypts of Thebes”. Most surprising in this mention is its uniqueness, since the Presl’s book is a compilation of information on mammals from various sources available at that time. However, no direct or indirect link to the source of such record is apparent in the case of this mention. Presl (1834: 173) describing *Plecotus barbastellus* gives a clear description* of the genus *Barbastella* Gray, 1821, with the distribution range in France and Germany where a dark-brown coloured form occurs, and in Egypt, where a cinereous coloured form exists. It seems most likely that Presl misinterpreted the information on Egyptian bats given primarily by Geoffroy (1818) – or secondarily by some other author who quoted Geoffroy’s data (e.g., Oken 1816, Desmarest 1820, Temminck 1824–1827, Fischer 1829, etc.).

* Presl (1834: 173): “Boltce přeširoké, dle niterného krage srostlé, na wenčjm kragi wyřiznuté; boltjčky dole přeširoké, na konci auzké, oblaučnaté, dolů okřiwené; chlup tmawohnědj, na samičkém konci plawý; blány barnawé. Welmi obecný gest we Francii; w Němcjch řjdko se nalézá. [...] Smrad osobliwý ze sebe wydává. Odrůda popelawělá s chlupy na konci popelawými; přebýwá w Egyptě we kryptách thebských.” [= “The auricles extremely wide, joined along their inner margins, at the outer margins marginated; the tragi very wide at bases, at tips narrow, rounded, down curved; hair is dark brown, at the total tip pale; wing membranes are brown. It is very common in France; in Germany it is rarely found. [...] It produces a typical odour. A cinereous variety with the hairs cinereous in their tips; it occurs in Egypt, in the crypts of Thebes.”]. The name combination *Plecotus barbastellus* was first introduced by Geoffroy (1832), indirectly already by Oken (1816); however, both authors mentioned the distribution of this species only in Europe.

From Egypt, Presl (1834) mentioned most of the species reported/described by Geoffroy (1818), viz. (under the current nomenclature), *Rousettus aegyptiacus*, *Rhinopoma microphyllum* s.l., *Asellia tridens*, *Taphozous perforatus*, *Nycteris thebaica*, and *Nyctinomus aegyptiacus*; however, he did not mention the two remaining Egyptian species of Geoffroy (1818), *Plecotus auritus* and *Vespertilio pipistrellus*, bats of these names were reported by Presl (1934) to occur only in Europe. According to Presl (1834), ‘*P. barbastellus*’ is the only Egyptian representative of the genus *Plecotus* Geoffroy, 1818, covering under Presl’s conception the modern genera *Plecotus*, *Barbastella*, *Corynorhinus*, *Histiotus*, and *Nyctophilus*. Additionally, among his 29 species of the genus *Vespertilio* Linnaeus, 1758, covering the modern genera *Aeorestes*, *Centronycteris*, *Eptesicus*, *Kerivoula*, *Lasiurus*, *Myotis*, *Miniopterus*, *Pipistrellus*, *Nyctalus*, *Peropteryx*, *Rhynchonycteris*, *Scotophilus*, *Vampyrus*, and *Vespertilio*, Presl (1834) did not report any African representative. On the other hand, Presl’s description* of the Egyptian variety of ‘*P. barbastellus*’ shows the characters from Geoffroy’s description of Egyptian *Vespertilio pipistrellus*, namely the cinereous colouration of the pelage – in almost identical words, see Geoffroy (1818: 117): “elle est cendrée, quand l’eupéenne est d’un brun plus décidé: c’est dans l’extrémité des poils que se trouve principalement cette différence” (see also Kock 1999b). Moreover, Geoffroy mentioned the latter species from “Thèbes, [...], et à Qâou-el-Koubarâ”, i.e., from the Nile Valley, while he reported *Plecotus auritus* only from “l’entrée de la grande pyramide” i.e., from Giza. (The *Plecotus* bat was first found in the area of Thebes by Anderson (1881), see below.)

In conclusion, the Presl’s variety of *Plecotus barbastellus* from Egypt joined some characters reported by Geoffroy (1818) for *Plecotus auritus* (size of ears and tragi) and for *Vespertilio pipistrellus* (pelage colouration, locality). This surprising combination is perhaps caused by the Fischer’s (1829: 104–105, 116–117) assignation of an identical name *aegyptius* to the Egyptian varieties of the two Geoffroy’s species (viz. *Vespertilio Pipistrellus* β. *Aegyptius*, vs. *V. auritus* β. *Aegyptius*), a nomenclatural act suggested already by Desmarest (1820). It is thus quite unlikely that the Presl’s (1834) report really refers to a record of the *Barbastella* bat.

The Egyptian (= Sinaitic) occurrence of *B. leucomelas* is the westernmost projection of the species distribution range that covers a limited area in arid areas around the northern edge of the Red Sea, i.e., the southern Holy Land, north-western Saudi Arabia, and Eritrea (von Heuglin 1877, Hayman & Hill 1971, Mendelssohn & Yom-Tov 1999, Benda et al. 2010, Aloufi et al. 2016). The records of *B. leucomelas* in Eritrea suggest a possible broader occurrence of this bat in Africa; it could be distributed in the Red Sea shore and/or mountains of the Sudan and Egypt, in a range connecting the Sinaitic and Eritrean occurrence spots. A similar type of range was already detected in *Hypsugo ariel* (see above).

TAXONOMY. *Barbastella leucomelas* is a bat species that was first described on the basis of a series of specimens originating from Egypt (Cretzschmar 1830). The issues concerning the delimitation of the type locality of *B. leucomelas* are discussed in detail in Distribution above, since the original species description was the only real report of this bat available from Egypt until 2005 (Fig. 30). Evaluating the description of the Arabian travels of Eduard Rüppell, the collector of the type series (Rüppell 1829), Benda et al. (2008: 53) suggested to restrict the type locality to ‘the area of the Sinaitic peninsula south of the connecting line between the towns of Suez and Aqaba’, or in terms of the administrative division of Egypt, ‘the Janub Sina’ Governorate’.

Although currently *B. leucomelas* is considered a monotypic species distributed in a limited range at the Afro-Arabian transition including Sinai (see López-Baucels 2019b), its taxonomic history was not straightforward. For a relatively long time, *B. leucomelas* was regarded a separate species, in accordance with the original description by Cretzschmar (1830), although under various combinations, viz. *Vespertilio leucomelas* (Temminck 1840, Wagner 1840, Hartmann 1868),

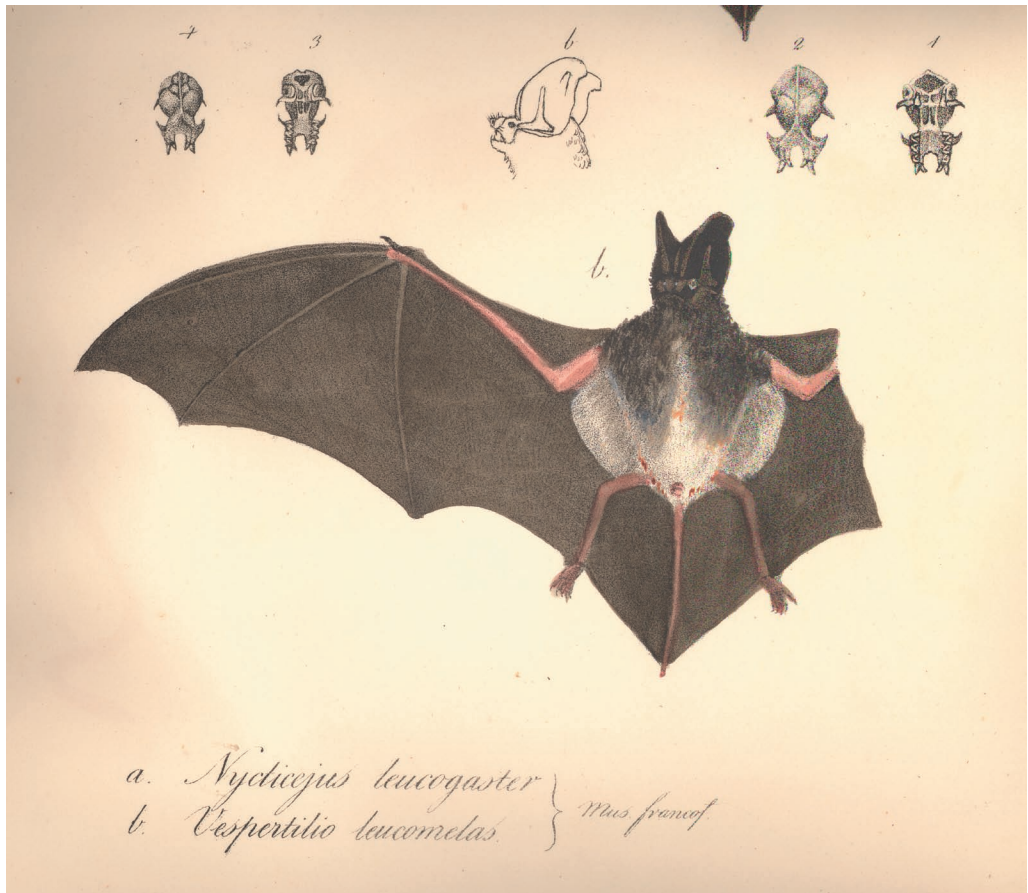


Fig. 30. An image of *Vespertilio leucomelas* Cretzschmar, 1830 [= *Barbastella leucomelas*] published as an illustration of the species description (Cretzschmar 1826–1830: Table 28).

Plecotus leucomelas (Lesson 1834, Gray 1838), and *Synotus leucomelas* (Rüppell 1842b, von Heuglin 1861a, b, Fitzinger & von Heuglin 1866, Fitzinger 1872, von Heuglin 1877). The status of *B. leucomelas* as a discrete species was first challenged by Peters (1866: 18), who argued as follows: “*Synotus leucomelas* Rüppell. Stimmt äußerlich ganz mit *Synotus barbastellus* überein, nur erscheint der Ausschnitt am äußern Ohrrende schwächer; die Ohrklappe hat ganz dieselbe Gestalt; Proportionen dieselben wie bei *S. barbastellus*. Es ist offenbar ein noch nicht vollkommen ausgewachsenes Thier. [...] Ist die geringe Verschiedenheit des Ohrs nicht bloß Folge der Jugend und des Eintrockens?” Finally, numerous authors considered *B. leucomelas* an integral part of the European forest bat, *B. barbastellus* (Schreber, 1774), not suggesting any separate position for these arid-dwelling populations, solely as a synonym (Dobson 1878, Jentink 1887, 1888, Trouessart 1897, 1904, de Winton in Anderson 1902, Senna 1905, Flower 1932, Mertens

1925, Allen 1939). Only Trouessart (1879) indicated a bit unique position of *leucomelas* within *barbastellus*, roughly at a level currently used for subspecies.

Tate (1942) revised the taxonomic arrangement of the genus *Barbastella* and tentatively placed the Sinaitic populations as a subspecies under the Indian taxon *B. darjelingensis* (Hodgson, 1855), until that time rather of uncertain taxonomic affiliation and position (for details see Benda & Mlíkovský 2008). Since Tate (1942) perhaps considered *leucomelas* of Sinai to be geographically only a small part of *darjelingensis*, distributed across a large part of southern Asia, he named the respective subspecies *B. darjelingensis leucomelas*, despite the priority of *leucomelas* over *darjelingensis*. This error was corrected by Ellerman & Morrison-Scott (1951), who arranged the species under the older name, and assigned the Sinaitic populations to *B. leucomelas leucomelas* and the populations living in the belt from the Caucasus to Japan to *B. leucomelas darjelingensis*. This taxonomic arrangement of the species *B. leucomelas* remained in use until almost recently, and the Egyptian, Levantine, and Eritrean populations have been considered a local nominotypical subspecies of a widespread Asian bat (Sanborn & Hoogstraal 1955, Harrison 1956, Hoogstraal 1962, Kuzâkin 1965, Hayman & Hill 1971, Harrison & Makin 1988, Harrison & Bates 1991, Koopman 1993, Bates & Harrison 1997, Rydell & Bogdanowicz 1997, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000, Simmons 2005). This view was slightly modified by the observation by Neuhauser & DeBlase (1974), who considered the pale-coloured (but large-sized) populations of *Barbastella* from the northern Middle East and West Turkestan to belong to the same form as the small-sized Sinaitic bats. This opinion was accepted by several following authors (Corbet 1978, DeBlase 1980, Koopman 1994), *B. l. leucomelas* was then thought to occur from Eritrea and Sinai to northern Iran. On the other hand, Kock (1969) suggested the Sinaitic populations of *Barbastella* to be a desert-dwelling pale-coloured subspecies of the medium-sized and dark-coloured *B. barbastellus* of Europe, and this view was followed by Gaisler et al. (1972), Largen et al. (1974), and Qumsiyeh (1985, 1996).

Additionally, Harrison (1964) considered *B. leucomelas* a species of its own, known (at that time) to occur only in Sinai and Eritrea. This rather tentative and old arrangement was shown to be the closest to the currently accepted view, which resulted from an analysis of morphologic and genetic traits (Benda et al. 2008). A small-ranged monotypic species *B. leucomelas* is now reported to occur from Sinai to the Dead Sea Basin in the north and northern Eritrea in the south (Benda et al. 2010, Duckworth & Pons 2011, Kruskop et al. 2012, 2019, Benda & Gaisler 2015, Kruskop 2015, López-Baucels 2019b, Yusefi et al. 2019).

Plecotus christii Gray, 1838

RECORDS. Published data: A s w a n: Aswan [1], Grenfell tombs, 24 March 1899: 1 ind. (Flower 1932 [as *P. auritus*]); Aswan (Allen 1939 [as *P. auritus*]); Aswan, 1 ind., BMNH (Qumsiyeh 1985 [as *P. austriacus*]). – E l B a h r E l A h m a r: Bir Kohila [2] in SW Qattar massive, May/June 1984: net. 1 m (Osborn 1988 [as *P. austriacus*]); Bir Kohila, Qattar Mts, 4 June 1984: 1 m, NMP (Benda et al. 2004b, 2006); Bir Kohila, Qattar Mts, 30 May 1984: 1 m, NMP (Benda et al. 2008, 2010); – Bir Nagat [3] in NW Qattar massive, May/June 1984: net. 1 m (Osborn 1988 [as *P. austriacus*]); Bir Nagat, Qattar Mts, 4 June 1984: 1 m, NMP (Benda et al. 2004b, 2006, 2008, 2010). – E l J i z a h: caves at Abu Rauwash [4], inds. (Macy et al. 1961 [as *P. auritus*]); Abu Rawash, caves, inds. (Heyneman & Macy 1962 [as *P. auritus*]); Abu Rawash, July 1958: 1 f, ASUC (Wassif et al. 1984 [as *P. austriacus*]); – Bahariya Oasis, Bawiti [5], abandoned building, 19 November 2010: obs. 1 ind. and remnants of a colony (Benda et al. 2014a); – El Badrshein [6], 3 inds., USNM (Qumsiyeh 1985 [as *P. austriacus*]); – à l'entrée de la grande pyramide [= El Jizah] [7] (Geoffroy 1818, 1828 [as *P. auritus*]); in pyramidibus Aegypti (Fischer 1829 [as *Vespertilio auritus*]); Mena House Hotel, 1 m (Anderson 1902 [as *P. auritus*]); Gizeh, Second Pyramid, 1 m (Anderson 1902 [as *P. auritus*]); Giza (Sanborn & Hoogstraal 1955 [as *P. auritus*]); Giza Pyramids, 2 inds., BMNH (Qumsiyeh 1985 [as *P. austriacus*]); Pyramids of Giza, 1 m, BMNH (Benda et al. 2006, 2010); Gizeh, 1 ind., BMNH (Spitzenberger et al. 2006); – Sakkara [8], tombs and pyramids, 1 March 1951: inds. (Macy et al. 1961 [as *P. auritus*]); Sakkara tombs and pyramids, inds. (Heyneman & Macy 1962 [as *P. auritus*]); Sakkara, 1–6 inds. (Koopman 1975 [as *P. auritus*]); Sakkara (Madkour 1978 [as *P. austriacus*]); Sakkara, January 1956: 1 m, June 1959: 1 m, 1 f, ASUC (Wassif

et al. 1984 [as *P. austriacus*]; Saqqara, 3 inds., CMNH, FMNH (Qumsiyeh 1985 [as *P. austriacus*]). – E l M i n i y a: Minia [9], 1 m (Anderson 1902 [as *P. auritus*]). – E l Q a h i r a h: Helwān [10], 1 ind., ZMB (Spitzenberger et al. 2006); – Kairo [11], 1 ind., NHMB (Engelmann 1912 [as *P. auritus*]); Cairo Area (Hoogstraal 1952 [as *P. auritus*]); Il Cairo, 1 m, MSNG (Lanza 1960 [as *P. wardi*]); near Cairo, crevices in desert hillsides (Hoogstraal 1962 [as *P. auritus*]); Dintoroli di Cairo, 15 July 1906: 1 m, MSNG (Benda et al. 2010). – E l U q s u r: tombs of the Kings [12], Babel Moulouk, left bank of the Nile, 18 January 1881: 3 m, 8 f, IMC (Anderson 1881 [as *P. auritus*], Ghosh 2008 [as *P. austriacus*]); Luxor (Thebe), 28 February 1882: 1 ind., MSNG (Doria 1887 [as *P. auritus*], Benda et al. 2010); Thebes, Tomb of Seti the First, 1 m (Anderson 1902 [as *P. auritus*]); Luxor, 1 m, MSNG (Lanza 1960 [as *P. wardi*]); Luxor, Valley of Kings, Tomb of Sethi II, 30 April 1969: 1 ma, IVB (Gaisler et al. 1972 [as *P. austriacus*], Benda et al. 2004b); Luxor (Madkour 1978 [as *P. austriacus*]); Thebes, Valley of Kings, 30 April 1969: 1 m, IVB (Benda et al. 2006, 2008, 2010); Theben, 1 ind., BMNH (Spitzenberger et al. 2006). – E l W a d i E l J a d i d: Dakhla Oasis, El Qasr [13], medina, 21 January 2010: net. 2 ma, NMP (Benda et al. 2010, 2014a); El Qasr, medina, Nasr El Din mosque, 2 March 2012: obs. 1 ind. (Benda et al. 2014a); El Qasr, at a sewage water pool, 2 April 2011: net. 1 fa (Benda et al. 2014a); El Qasr, palm orchard, 31 March 2011: net. 1 ma, NMP, 3 April 2011: net. 2 fa (Benda et al. 2014a); Dakhla Oasis, 2 inds., NMP (Karmáčková 2017); – Dakhla Oasis, Hindaw [14], a tomb 3 km NW of the village, 6 December 2010: coll. 1 m, NMP (Benda et al. 2010, 2014a). – J a n u b S i n a': Ain Sudr [15], oasis, 18 September 2005: net. 1 fa, NMP (Benda et al. 2008, 2010, Mlikovský et al. 2011);

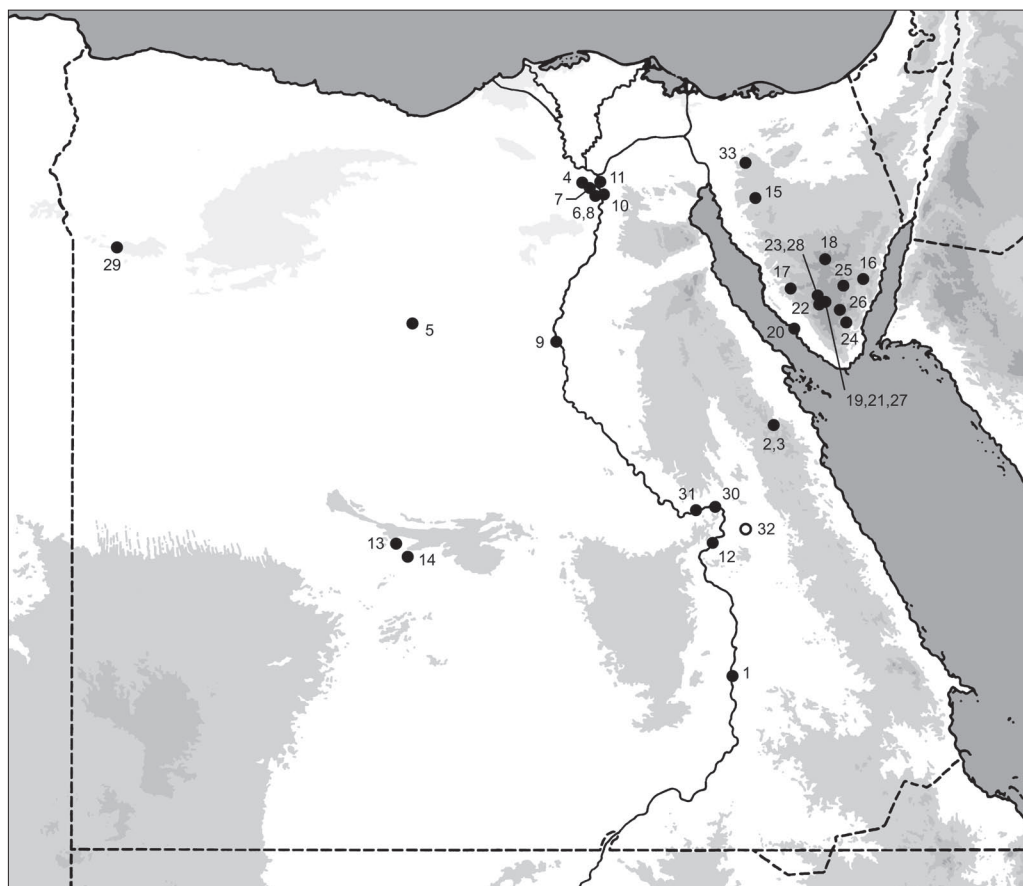


Fig. 31. Records of *Plecotus christii* Gray, 1838 in Egypt; for explanations see Fig. 3. Open symbol denotes a record of uncertain species identification (for details see text).

– Ein Hodra Oasis [16], Wadi Hodra, 4 August 2005: net. 1 ma, 5 August 2005: net. 2 ma, 1 ms, 1 fa (Dietz 2005b, Dietz & Maltby 2006); Ain Hodra Oasis, 5 July 2007: net. 1 fa (Truscott 2007); Ain Hudra, oasis, 4 August 2005: net. 1 ma, 5 August 2005: net. 2 ma, 1 ms, 1 fa, CDIS, 13 September 2005: det. & rec. 1 ind., 15 September 2005: net. 1 ma, NMP, 5 July 2007: net. 1 fa (Benda et al. 2008, 2010, Mlíkovský et al. 2011, cf. Mayer et al. 2007); – Feiran Oasis [17], Wadi Feiran, garden el Braga, 10 August 2005: net. 3 ma, 11 August 2005: net. 5 ma, 1 ms (Dietz 2005b, Dietz & Maltby 2006); Feiran, garden, 10 August 2005: net. 3 ma, 11 August 2005: net. 5 ma, 1 ms, 10 September 2005: net. 1 ma, NMP (Benda et al. 2008, 2010); Feiran, above a pool in, 8 September 2005: net. 1 ma, NMP (Benda et al. 2008, 2010, Mlíkovský et al. 2011); – Jabal El ‘Ajmah [18], 5 inds., HUJ (Qumsiyeh 1985 [as *P. austriacus*]); – St. Catherine Monastery [19], 1 ind., HUJ (Qumsiyeh 1985 [as *P. austriacus*]); St. Katrina village & surrounds, at a house in the village, 8 July 2007: net. 1 ma (Truscott 2007); El Milga, garden, 9 September 2005: net. 1 fs, NMP (Benda et al. 2008, 2010, Mlíkovský et al. 2011); El Milga, Mansour’s house, 8 July 2007: capt. 1 ma (Benda et al. 2008); – Tor [20], 1 f, BMNH (Anderson 1902, Flower 1932 [as *P. auritus*], Harrison 1964 [as *P. austriacus*], Benda et al. 2006 [as *P. cf. christii*], 2010); Tor, 1 ind., BMNH (Qumsiyeh 1985, Harrison & Bates 1991 [as *P. austriacus*]); El Tur, Sinai, 2 inds., BMNH, ZMB (Spitzenberger et al. 2006); El Tur, Hammam Musa, building, 10 September 2005: found 1 ma, NMP, above a pool, 11 September 2005: net. 1 fa, NMP (Benda et al. 2008, 2010, Mlíkovský et al. 2011); – Wadi Arbain [21] (Ramadan’s garden), 1 August 2005: obs. & rec. 1 ind. (Dietz 2005b, Dietz & Maltby 2006); Wadi El Arbaein, Ramadan’s Garden, 1 August 2005: det. & rec. 1 ind. (Benda et al. 2008); – Wadi Gebal [22] (Hussein’s garden), 7 August 2005: net. 2 fa (Dietz 2005b, Dietz & Maltby 2006); Wadi Gebal, Hussein’s Garden, 7 August 2005: net. 2 fa (Benda et al. 2008); – Wadi Gharaba [23], 12 July 2011: net. 1 ind. (Fouf 2011); – Wadi Kid [24], garden, 19 July 2007: net. 1 ma, 1 ind. (Truscott 2007, Benda et al. 2008); – Wadi Marra [25], 13 July 2006: net. 1 fa (Dietz & Maltby 2006, Benda et al. 2008); – Wadi Nasb [26], Awad’s Garden, 28 June 2006: net. 1 ma (Dietz & Maltby 2006, Benda et al. 2008); Wadi Nasb, animal pool, 27 July 2011: net. 1 ind. (Fouf 2011); – Wadi Shagg [27], Oder’s Garden, 26 July 2006: net. 1 ma, 1 fa (Dietz & Maltby 2006, Benda et al. 2008); – Wadi Sheikh awad [28], Ecolodge Al-Karm, 17 August 2005: net. 1 ma, 18 August 2005: net. 1 ma (Dietz 2005b, Dietz & Maltby 2006); Sheikh Awad, El Karm Ecolodge, 17 August 2005: net. 1 ma, 18 August 2005: net. 1 ma (Benda et al. 2008). – M a t r u h: Siwa [29], 1935: 1 f (Hayman 1949); Western Desert (Siwa Oasis) (Sanborn & Hoogstraal 1955 [as *P. auritus*]); Siwa Oasis (Hoogstraal 1962 [as *P. auritus*]); Siwa Oasis, inds. (Heyneman & Macy 1962 [as *P. auritus*]); Siwa, 1–6 inds. (Koopman 1975 [as *P. auritus*]); Siwa Oasis, March 1953: 1 f, ASUC (Wassif et al. 1984 [as *P. austriacus*]); Siwa, 11 inds., BMNH, FMNH, USNM (Qumsiyeh 1985 [as *P. austriacus*]); Siwa Oasis (Wassif 1995 [as *P. austriacus*]); Siwa Oasis, 1 f, BMNH (Benda et al. 2004b, 2006, 2008, Spitzenberger et al. 2006). – Q e n a: Dandara [30], 4 inds, MQC (Qumsiyeh 1985 [as *P. austriacus*]); – Deshna [31], Markaz building, 27 April 1918: 1 ind. (Flower 1932 [as *P. auritus*]); – el-Gjdda [= El Lageita] [32], 1855: 1 ind. (Frauenfeld 1856 [as *P. brevimanus*]). – S h a m a l S i n a’: Um Hashiba [= Umm Khisheib] [33], 1 ind., TAU (Qumsiyeh 1985 [as *P. austriacus*]); Northern Sinai (Wassif 1995 [as *P. austriacus*]); Um Hashiba, 1 December 1977: 1 m, TAU (Benda et al. 2006 [as *P. cf. christii*], 2008, 2010).

IMPRECISE RECORDS. Egypte, 1 ind. (Geoffroy 1806 [as *Vespertilio auritus*]); Aegypten (Oken 1816 [as *Vespertilio auritus, minor*]); Egypte (Desmarest 1820 [as *Vespertilio auritus*]); in pyramidibus Aegypti (Fischer 1829 [as *Vespertilio auritus*]); Egypt, 1 ind., BMNH (Gray 1843); Ägypten (Fitzinger & von Heuglin 1866 [as *P. aegyptiacus*]); Ägypten, 1 ind. BMNH (Peters 1866 [as *P. auritus*]); Aegypten (Hartmann 1868 [as *Vespertilio auritus*]); Aegypten (Fitzinger 1872 [as *P. aegyptiacus* and *P. Christii*]); Egypten (von Heuglin 1877 [as *P. aegyptiacus*]); Egypt, 4 fa, BMNH (Dobson 1878 [as *P. auritus*]); Egypte (Trouessart 1879 [as *P. auritus*]); Ägyptus (Trouessart 1897 [as *P. auritus*]); Egypten (Palacký 1901 [as *P. auritus*]); Ägyptus (Trouessart 1904 [as *P. auritus*]); Egypt, 1 ind., BMNH (Flower 1932 [as *P. auritus*]); Egypte (Gohar 1934 [as *P. auritus*]); Egypt (Allen 1939, Hoogstraal 1955, 1956 [as *P. auritus*]); Egitto, 1 m, MZUF (Lanza 1960 [as *P. wardi*]); Egypt (Myers et al. 1962 [as *P. auritus*]); Ägypten, 4 inds., USNM (Hanák 1966 [as *P. austriacus*]); Egypt (Madkour 1976b [as *P. austriacus*]); A. R. Egypt, inds. (Madkour 1977c [as *P. austriacus*]); Egypt, 1 ind., MCZ (Qumsiyeh 1985 [as *P. austriacus*]); Egypt, 1 ind., ZIN (Kruskop & Lavrenchenko 2000); Egypt, 1 ind., BMNH (Spitzenberger et al. 2006); Egitto, 1843: 1 ind., MZUF (Benda et al. 2010). – nordlichen Theil von Ägypten (Fitzinger 1861 [as *P. auritus*]). – Desert variety, Nile, 4 inds., BMNH (Flower 1932 [as *P. auritus*]); Desert variety, Nile, 5 inds., BMNH (Qumsiyeh 1985 [as *P. austriacus*]); Nile, 2 inds., BMNH (Spitzenberger et al. 2006). – N. Africa, BMNH (Gray 1838); North Africa, 1 ind., BMNH (Gray 1843); N. Africa, 1 ind., BMNH (Dobson 1878 [as *P. auritus*]); North Africa (Allen 1939 [as *P. auritus*]); North Africa (Ellerman & Morrison-Scott 1951, 1966 [as *P. auritus*]); Nord-Afrika (Kock 1969 [as *P. austriacus*]); southern Egypt (the Nile Valley between Qena and Aswan) (Qumsiyeh 1985 [as *P. austriacus*]); North Africa (= Nile Valley between Qena and Aswan), 1 ind., BMNH (Benda et al. 2004b, 2006, 2008, 2010). – vicinity of Cairo [10–11] and Giza [4–8] Province, October 1959–October 1961: 2 inds. (Mohammed & Saoud 1965 [as *P. auritus*]). – Cairo [10–11], Gizeh [4–8] and Theben [12], 2 inds., BMNH (Spitzenberger et al. 2006).

DISTRIBUTION. *Plecotus christii* is a rather common bat species in Egypt, it has been found in 33 localities (Fig. 31; Table 2). It is the fifth most frequent bat of the country, documented in all geographic regions of Egypt except the Nile Delta and Mediterranean Sea shore, i.e., it is pre-

sent in all arid parts of the country and missing only in the humid littoral regions. It is the most common bat species in Sinai, almost a half of the Egyptian records of *P. christii* originate from this peninsula. However, in all occupied regions of Egypt apart from Sinai, *P. christii* represents a rather medium-frequent bat (Table 2).

The Egyptian records of *P. christii* are available from a very wide altitude range of –7–1890 m a. s. l. (median 280.0 m, mean 568.7 m; Fig. 4, Table 3). The localities in the continental African part of Egypt and in Sinai lie in altitude ranges rather similar to each other; in the wide range of –7–1085 m a. s. l. in the continent (median 76.5 m, mean 174.8 m), and in a very wide range of 13–1890 m a. s. l. in Sinai (median 1055.0 m, mean 1011.8 m; Fig. 5, Table 4). Hence, *P. christii* seems to represent one of the most montane bat species of Egypt.

The first Egyptian specimen/s of *Plecotus* bats were recorded at the time of the French occupation of the country in 1798–1801 (Geoffroy 1806, 1818; Fig. 13). Other two specimens were collected by two travellers to Egypt at the beginning of the 19th century and presented to the BMNH collection (Gray 1843). One of these specimens was collected by the egyptologist John G. Wilkinson (1797–1875) during his first stay in Egypt in 1821–1833, another one served as the type specimen of *Plecotus christii*, and was collected by the physician Alexander Turnbull Christie (1801–1832) in the 1820s. However, Gray (1838: 495) describing the new species did not specify the origin of the specimen in detail, but stated only that the new species “inhabits N. Africa”. The slightly misleading term ‘North Africa’ was later mentioned as the type locality of *P. christii* by numerous authors (Dobson 1878, Allen 1939, Ellerman & Morrison-Scott 1951, 1966, Kock 1969, Koopman 1975, Corbet 1978). Nevertheless, Gray (1843) again mentioned this BMNH specimen and named *P. christii* as the Egyptian long-eared bat, thus suggesting the Egyptian origin of the type of this species. Additional BMNH specimens of three other bat species collected by A. T. Christie and listed by Anonymous (1839) and Gray (1848) are labelled solely as originating from ‘Egypt’.

Qumsiyeh (1985: 68) first tried to solve the problem of the type specimen origin and the wide definition of the type locality, respectively, and identified the type locality as ‘southern Egypt (the Nile Valley between Qena and Aswan)’ (this restriction was accepted by the followers, see Benda et al. 2004b, 2008, Spitzenberger et al. 2006, Benda & Aulagnier 2013). However, the restriction was made just arbitrarily, without any real basis in evidence given by A. T. Christie or by secondary sources. Since A. T. Christie travelled across the whole Egypt of that time including parts of the present Sudan (see Gray 1843, Qumsiyeh 1985), the origin of his specimen just in the restricted section of the Nile Valley is not well substantiated and may be accepted only tentatively. For the time being, the type locality of *P. christii* cannot not be placed to Egypt with certainty and it is not considered here as a clear Egyptian record.

A collection of another specimen (most probably the fourth one) of *Plecotus* from Egypt was reported by Frauenfeld (1856) from the tiny oasis of El Lageita (Qena Governorate) in 1855; he mentioned the finding as follows (p. 321): “In el-Gjdda, einem Dorfe der Ababdech in der Wüste [...] fing ich nur eine einzige longohrige Fledermaus, wahrscheinlich den ägyptischen *Plecotus brevimanus*, [...]”. This report was accepted as a record of *Plecotus austriacus christiei* [= *P. christii*] by Kock (1969), Qumsiyeh (1985) and Osborn (1988), although by Kock (1969) with a certain reservation†. However, the name *Plecotus brevimanus* was created by Jenyns (1828) based on the material from England and representing the small-sized and brownish coloured re-

† Kock (1969: 181–182): “Bemerkenswert ist, daß Frauenfeld (1856) eine ‘*Plecotus brevimanus*’ in El-Gjdda [...] sammelte. ‘*brevimanus*’ in dieser Kombination wird als Synonym zu *Plecotus auritus auritus* betrachtet, während *Plecotus auritus brevimanus* als ein Synonym von *Otonycteris hemprichi* gilt [...]. Frauenfeld’s Fund ist von Interesse, da er weder aus dem Niltal noch aus einer Oase stammt, sondern aus der Felswüste; er muß jedoch mangels Belegstück fraglich bleiben.”

presentative of *Plecotus* (distinct from a large-sized and greyish coloured form), so, it is clearly affiliable as a synonym to *P. auritus* (Linnaeus, 1758) of the current taxonomy (cf. Spitzenberger et al. 2006). But this name was also used as a species name by other authors in slightly shifted senses, see e.g., Fischer (1829) or Bonaparte (1832–1841). However, in case that Frauenfeld (1856) used the name *P. brevimanus* in the sense by Jenyns (1829), he perhaps wanted to express the relatively small size of the Egyptian *Plecotus* bat and this character fits well *P. christii* (see Benda et al. 2004b or Spitzenberger et al. 2006). On the other hand, Frauenfeld (1856) did not accompany his report with any clear identification character of the collected bat, and thus, possible confusion with other long-eared bat species than those of the genus *Plecotus*, such as *Otonycteris hemprichii* or *Nycteris thebaica*, cannot be excluded. Therefore, this record is here considered as rather uncertain.

Osborn (1988) reported captures of two males of *P. christii* in the Red Sea mountains west of Hurghada in the early summer of 1984 (exact dates were not provided). These specimens are currently deposited in the NMP collection and were published in the catalogue of Egyptian bats of this collection (Benda et al. 2008). However, the previous publications (Benda et al. 2004b, 2006) did not report the correct data on collection of these bats, this error was corrected by Benda et al. (2008, 2010); the specimen data are as follows: ♂, NMP 90119, Bir Kohila, SW Qattar Mts. 30 May 1984, leg. D. J. Osborn; ♂, NMP 90118, Bir Nagat, NE Qattar Mts., 4 June 1984, leg. D. J. Osborn.

The current picture of *P. christii* distribution in Egypt mostly conforms to the view given by Qumsiyeh (1985), the numbers of records has not changed in the Nile Valley and Cairo Region. On the other hand, numerous records of *P. christii* have been added in Sinai (Benda et al. 2008, Foui 2011), their number in this region has increased almost four times in comparison with that of Qumsiyeh (1985). Osborn (1988) discovered this bat in the Red Sea mountains and Benda et al. (2014a) in two oases of the Western Desert.

The Egyptian occurrence area of *P. christii* represents the prevailing part of the species distribution range (Nader & Kock 1990b, Spitzenberger et al. 2006, Benda & Aulagnier 2013, López-Baucels 2019c). In the east, the Sinaitic common occurrence of this bat continues to the limited (but abundantly occupied) range in the arid southern part of the Holy Land (Mendelssohn & Yom-Tov 1999, Benda et al. 2010). Only one site of occurrence of this bat is known from north-western Saudi Arabia (Aloufi et al. 2016), and from eastern Libya, *P. christii* was repeatedly recorded in the oasis of Al Jaghbub, a part of the Siwa depression (De Beaux 1928, Lanza 1960, Benda et al. 2004b, 2014b). Two localities are available from the northern Sudan and they represent the southern limits of the species distribution, one bat was collected at Ferka, some 120 km south of the Egyptian border (Benda et al. 2010), and another bat at the Fifth Cataract of the Nile, ca. 400 km south of the Egyptian territory (Flower 1932).

TAXONOMY. As summarised above, the description of *Plecotus christii* is based on a specimen originating most probably in Egypt or Sudanian Nubia. The type locality was originally treated as ‘North Africa’ (Gray 1843) and later it was restricted to ‘southern Egypt (the Nile Valley between Qena and Aswan)’ (Qumsiyeh 1985); since the restriction is not justified considering the available evidence, we suggest to consider the type locality as ‘the Nile Valley of Egypt and Nubia, roughly between Cairo in Egypt [30°03’N, 31°15’E] and Berber in the Sudan [18°01’N, 33°59’E]’. This delimitation corresponds with the travelling scheme of A. T. Christie (his acquisitions to the British Museum came from Giza, Thebes, and Egypt; the BMNH acquisitions are all labelled ‘Egypt’ or ‘Nubia’, see Anonymous 1839*) and also with the distribution limits of *P. christii* in the Nile Valley (see above). This corrected meaning of the type locality includes the whole area of the type locality as suggested by Qumsiyeh (1985), which represents about 16%

(410 km) of the Nile Valley between Cairo and Berber (2,580 km). The corrected delimitation does not affect the taxonomic stability, since this whole area is a part of the distribution range of the nominotypical subspecies of *P. christii* (Benda et al. 2008, 2010, see below). López-Baucels (2019c) used a similar definition of the type locality, ‘Nile Valley, Egypt’. On the other hand, a chance still remains that the type locality will be identified more precisely, since Christie’s archive is deposited in the National Library of Scotland; a search in these materials could bring specific data on Christie’s travels and collections in North Africa.

The full species position of *P. christii* has been confirmed rather recently (Benda et al. 2004b, Spitzenberger et al. 2006), although it was sometimes suggested already earlier (Fitzinger & von Heuglin 1866, Fitzinger 1872, von Heuglin 1877, Thomas 1911a, 1913b, Hayman 1949). Originally and then most frequently, the Egyptian populations of *Plecotus* were affiliated to *P. auritus* (Linnaeus, 1758) (see Records), later on, to *P. wardi* Thomas, 1911 (Lanza 1960), and finally to *P. austriacus* (Fischer, 1829) (Hanák 1962, 1966, Harrison 1964, Kock 1969, Hayman & Hill 1971, Gaisler et al. 1972, Madkour 1976b, 1977c, 1978, Wassif et al. 1984, Qumsiyeh 1985, Koopman 1986, 1994, Osborn 1988, Le Berre 1990, Harrison & Bates 1991, Wassif 1995, Horáček et al. 2000, Ghosh 2008); in all three taxonomic conceptions, the Egyptian populations were a part of the species, considered widely distributed across the Palaearctic.

However, morphological differences of the Egyptian populations of *Plecotus* compared to the European ones were observed already when these bats were discovered and described (Geoffroy 1806, 1818). Thus, a peculiar taxonomic position of these populations within the species *P. auritus* (or *Vespertilio auritus*, respectively) were suggested shortly after their discovery, based on the Geoffroy’s description. Desmarest (1820: 144) differentiated an Egyptian form ‘Variété A. Oreillard d’Egypte’ from the European *Vespertilio auritus* (besides an Austrian form ‘Variété B. Oreillard d’Autriche’) and Fischer (1829: 117) used this scheme for naming the Egyptian form as *Vespertilio auritus* *β. Aegyptius* (plus *V. a. γ. Austriacus*), i.e., in a version available for modern nomenclature. Since the name was created based directly on the indication given by Geoffroy (1806, 1818), the Geoffroy’s specimen collected at “l’entrée de la grande pyramide” represents the type specimen of this name (Fig. 13) and the Great Pyramid of Giza [29°58’45”N, 31°08’03”E] is the type locality. Unfortunately, the name *aegyptius* is pre-occupied by the name *Vespertilio Pipistrellus* *β. Aegyptius* Fischer, 1829 created by the identical author in the identical volume (p. 105; see also under *Pipistrellus kuhlii*) and thus, *Vespertilio auritus aegyptius* is unavailable for designation of the Egyptian populations of the *Plecotus* bats.

Several years later, another name was created based on the presumably Egyptian populations of *Plecotus*; Gray (1838: 495) described *Plecotus christii* as a new species. A rather simple description reads as follows: “Fur pale, hairs whitish with dusky tips; beneath white; spur very long; intermembral membrane with 11 or 12 cross lines of vessels on the back of the thigh and skin; tragus half as long as the ears. Inhabits N. Africa. Dr Turnbull Christie. British Museum.” Anyway, this name

* NOTE. In 1835, three years before the description of *Plecotus christii* and four years after Christie’s death, a zoological bequest by A. T. Christie arrived to the BMNH collection (Anonymous 1839); it contained seven mammals including five bats (1 ind. of *Rhinopoma microphyllum* s.l., 2 *Asellia tridens*, 2 *Rousettus aegyptiacus*), 36 birds, and seven beetles; all specimens were labelled as coming from ‘Egypt’, i.e., present territory of Egypt and the Sudan (including South Sudan). Gray (1843) mentioned the following mammal specimens of the BMNH collection presented by A. T. Christie, viz. 4 inds. of *Rousettus aegyptiacus*, 4 *Rhinopoma microphyllum* s.l., 3 *Asellia tridens*, 1 *Plecotus christii*, 1 *Canis anthus*, 2 *Vulpes vulpes*, 1 *Felis lybica*, 1 *Gazella bennettii*. Besides *C. anthus*, labelled ‘Nubia’, and *P. christii* labelled ‘North Africa’, all specimens originate from ‘Egypt’; the Indian gazelle was the only specimen without locality. However, the gazelle arrived to the BMNH collection in 1931, when Christie presented a series of (at least) seven specimens of six mammal species from Madras (Anonymous 1833: 108); apparently, only the gazelle specimen of this shipping survived in the collection until 1843.

is the oldest available for the populations of the genus occurring in Egypt and by most authors it has been used to name these populations. Moreover, an additional name appeared concerning the Egyptian *Plecotus* populations; Fitzinger & von Heuglin (1866: 545) created the name *Plecotus aegyptiacus* for bats of Egypt and Abyssinia, mentioning the names *Plecotus auritus* var. *Aegyptius* and *P. christii* as synonyms. However, they did not accompany the name by a description of the species and thus, the name represents a nomen nudum. Nevertheless, as a formal description of *Plecotus aegyptiacus* could serve the detailed characterisation given by Fitzinger (1872: 73) in his synopsis of bats; although the distribution of this species covers ‘Nordost-Afrika, Aegypten, Abyssinien und Schoa’, it has a different meaning than that by Fitzinger & von Heuglin (1866), since it does not include *P. christii* as a synonym. Fitzinger (1872) considered the latter name to represent a separate species occurring only in Egypt. Since only one *Plecotus* species is known to occur in the north-easternmost part of Africa, and considering the description and synonymy given by Fitzinger (1872), it is clear that the names *aegyptiacus* Fitzinger and *christii* Gray are synonymous, with the latter being prior over the former (see e.g., Ellerman & Morrison-Scott 1951, or Kock 1969). Despite this, Allen (1939: 96) adopted the former name for designation of the North African populations of the genus as *P. auritus aegyptiacus* [Isidore] Geoffroy, 1832 (considering erroneously the publication year and authorship of the name; cf. Fitzinger & von Heuglin 1866, Fitzinger 1872, Dobson 1876a, 1878, von Heuglin 1877).

Since Ellerman & Morrison-Scott (1951), the name *christii* Gray has been regularly used for naming the Egyptian populations of the genus, first as *P. auritus christiei* (Hoogstraal 1955, Sanborn & Hoogstraal 1955, Macy et al. 1961, Heyneman & Macy 1962, Hoogstraal 1962), once as *Plecotus wardi christiei* (Lanza 1960), and most frequently as *P. austriacus christiei* (Bauer 1960, Harrison 1964, Hanák 1966, Kock 1969, Hayman & Hill 1971, Gaisler et al. 1972, Atallah 1977, Corbet 1978, Hanák & Elgadi 1984, Qumsiyeh 1985, 1996, Strelkov 1988, Nader & Kock 1990b, Harrison & Bates 1991, Koopman 1994, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000, 2004, Kruskop & Lavrenchenko 2000, Hoath 2003, Simmons 2005).

Although Gray (1838: 495) originally used the spelling *christii* for the species name, most authors adopted to name the subspecies with the emended version *christiei*, first used by Thomas (1911a), with an apparent reference to the correct written form of the surname of A. T. Christie. This emendation could be considered as justified, being regarded as a ‘correct original spelling’ in accordance with the ICZN (1999: Art. 33.3.1). However, here we use the original spelling *christii* that reflects Gray’s opinion to use a latinised form of the personal name (Christius, *christii*). The use of original spellings originating from latinised personal names currently absolutely prevails over the emended spellings across the bat nomenclature (see Simmons 2005). The original version of the name *christii* was used already by Harrison & Bates (1991), Mendelssohn & Yom-Tov (1999), Horáček et al. (2004), and Simmons (2005) for the subspecies (*P. austriacus christii*), and by Benda et al. (2004b, 2006, 2007, 2008, 2010, 2014a, b), Benda & Aulagnier (2013), Kingdon (2015), and López-Baucels (2019c) for naming the species.

The form *christii*, whether as a full species or a subspecies, has been reported in two or even three geographical meanings. Originally, all the *Plecotus* populations of North Africa (including the Maghreb, Sudan, Ethiopia, and Egypt) and south-western Asia were considered under this name (Ellerman & Morrison-Scott 1951, Harrison 1964, Hayman & Hill 1971, Atallah 1977, Horáček et al. 2000), while some authors mentioned only North Africa as a range of this form (Bauer 1960, Hanák 1962, 1966, Hill 1964, Kock 1969, Gaisler et al. 1972, Corbet 1978, Strelkov 1988). Hanák & Elgadi (1984) and Qumsiyeh (1985) simultaneously discovered an existence of two morphotypes of the *Plecotus* bats occurring in North Africa, large-sized and dark coloured in the Mediterranean habitats of the Maghreb and Cyrenaica, and small-sized and pale coloured in the deserts of eastern Libya and Egypt. These authors co-identified coincidentally the former morphotype

with *P. austriacus austriacus* and the latter with *P. a. christii*. As a result, the distribution range of the form *christii* was then restricted to an area covering eastern Libya, the northern Sudan, whole Egypt, and the southern Holy Land (Nader & Kock 1990b, Harrison & Bates 1991), and according to Koopman (1994) and Kruskop & Lavrenchenko (2000) also Ethiopia and/or Eritrea.

The full species position of *P. christii* was suggested by Benda et al. (2004b), based on the results of morphological and genetic analyses of materials of the *Plecotus* bats from the western Palaearctic; the identical opinion was given also by Spitzenberger et al. (2006), who analysed materials from a wider geographical scope than the former authors. Since Benda et al. (2004b) and Spitzenberger et al. (2006) referred only the populations of continental Africa (Egypt, N Sudan, and E Libya) to *P. christii*, the status of the populations of Sinai and the southern Levant remained unclear. This problem was resolved by Benda et al. (2008), who demonstrated a close phylogenetic relationship of the *Plecotus* populations from Libya, Sinai and Jordan, and thus, the belonging of the southern Levantine and Sinaitic populations to *P. christii*, in accordance with the opinions by Harrison (1964), Hayman & Hill (1971), Atallah (1977), Nader & Kock (1990b), Harrison & Bates (1991), Qumsiyeh (1996), Mendelssohn & Yom-Tov (1999), and/or Horáček et al. (2000).

The geographical variation in *P. christii* was evaluated by Benda et al. (2008, 2010). The species comprises two size morphotypes and both forms occur in Egypt. While the small bats inhabit the desert habitats of continental Africa and represent the nominotypical form, the large bats occurring in Asia are a newly described subspecies *P. c. petraeus* Benda, 2008. The latter subspecies was described based on the specimens from Sinai, Benda et al. (2008: 71) defined the type locality as ‘Egypt, Sinai (Governorate of Janub Sina), Wadi Feiran, western edge of the oasis of Feiran, 28°43’N, 33°37’E, 595 m a. s. l.’.

Although these two morphotypes/subspecies partly overlap in their dimension ranges (Benda et al. 2008, 2010), no cline but a step shift in size characters between the two basic geographical ranges is present. Thus, the geographical delimitation of the two taxa within *P. christii* seems to be well supported on morphological grounds, but still remains to be proved also by molecular genetic methods. Anyway, this step shift in body size between the African and Asian parts of the species range indicates a different type of geographic variation in the morphometric traits than that documented in *Rhinopoma cystops*, *Asellia tridens*, and/or *Pipistrellus kuhlii*, where it does not give a foundation for taxonomic division (see above).

***Tadarida teniotis* (Rafinesque, 1814)**

RECORDS. Published data: E l B e h e i r a h: Wadi El-Natroun [1], 6 m, 13 f, ASUC (Wassif et al. 1984); Wadi El Natrun, garden, 20 February 2005: det. calls of 1–2 inds. (Benda et al. 2014a). – E l J i z a h: Aburoash [2], 1 ind. (Bonhote 1909); Aburoash, cave, 27 February 1903: 2 inds., 31 March 1903: 2 inds., 1907, 1908 & 1914, several inds., 26 & 28 March 1922: 2 inds. (Flower 1932); Abu Rawash, 18 September 1952: inds., 22 September 1952: 1 ind. (Traub 1954); Abu Roash, 10 km. W. Cairo, 10 inds., BMNH, HZM (Lewis & Harrison 1962); Abu Rawash, September (Hoogstraal & Traub 1963); Abu Rawash, 28 September 1945: 2 inds. (Haas & Tomich 1973); Abu Rawash, coll. 20 inds. (Madkour 1977b); Abu Rawash (Madkour 1978); Aburoash/Aburawash, 1 m, 1 f, BMNH, FMNH (Freeman 1981); Abu Rawash, 12 November 1951: 2 m, 1 f, FMNH (Kock & Nader 1984); Abu Rawash, 11 inds., October 1941: 1 m, October 1947: 8 inds., October 1953: 1 f, November 1956: 1 m, 4 f, July 1966: 1 m, 1 f, ASUC (Wassif et al. 1984); Abu Rawash, 42 inds., BMNH, FMNH, USNM (Qumsiyeh 1985); Abu Roash, 27 February & 31 March 1903: 1 m, 1 f, 2 inds., BMNH (Benda et al. 2012b, 2014b); Aburoash, Giza, March 1914: 1 m, BMNH (Benda et al. 2012b, 2014b); Giza, 26 & 28 March 1922: 1 m, 1 f, BMNH (Benda et al. 2012b, 2014b); “Memphis”, 5 inds., FMNH (Amorim et al. 2020); – Giza [3] (Sanborn & Hoogstraal 1955); Giza, 2 inds., BMNH (Lewis & Harrison 1962); near Giza, 10 inds., BMNH (Lewis & Harrison 1962); Giza Pyramids, 14 February 1952: 1 f, FMNH (Kock & Nader 1984); Giza Pyramids, 5 inds., BMNH, FMNH, USNM (Qumsiyeh 1985); Giza (Wassif 1995); near Giza, 17 November 1908: 1 f, BMNH (Benda et al. 2012b, 2014b); “Memphis”, 1 ind., FMNH (Amorim et al. 2020); – Imbaba [4], Abu Rawash, 21 January 1954: 1 ind. (Keegan 1956); Imbaba, Abu Rawash, 21 January 1954: 1 ind. (Radovsky 1967); – Saqqara [5], 1 ind., USNM (Qumsiyeh 1985). – E l Q a h i r a h: Cairo Area [6] (Hoogstraal 1952); near Cairo, 1 ind., USNM (Setzer 1952); Kairo, 1910: 1 m, ZFMK (von

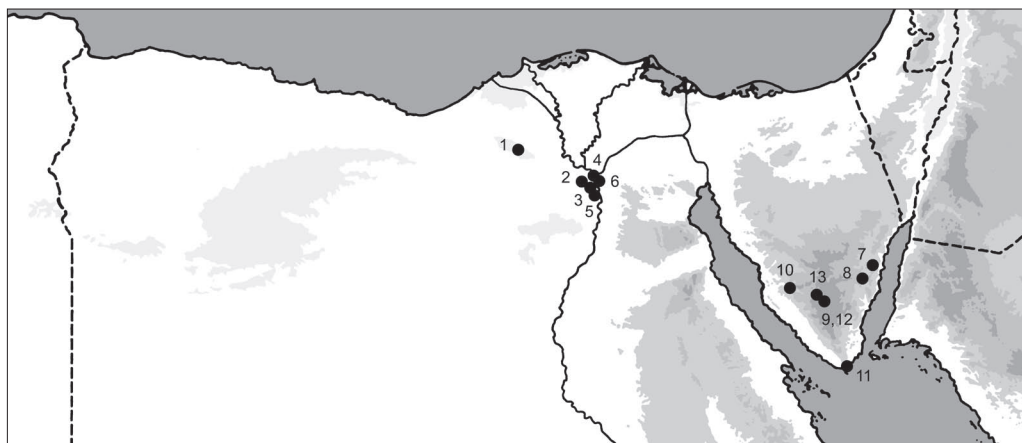


Fig. 32. Records of *Tadarida teniotis* (Rafinesque, 1814) in Egypt; for explanations see Fig. 3.

Lehmann 1964 [the respective specimen was re-identified as *Rhinopoma microphyllum* by Nader & Kock (1983c)]; Cairo, October 1956: 1 f, ASUC (Wassif et al. 1984); Cairo, 2 inds., USNM, ZMUC (Qumsiyeh 1985); Cairo (Wassif 1995); Dintorni di Cairo, 15 March 1906: 1 m, MSNG (Benda et al. 2012b, 2014b); El Qahirah, Muqattam, old quarries, 29 January 2010: obs. & det. calls of several individuals emerging from crevices in a cliff (Benda et al. 2014a). – J a n u b S i n a' : Ain El Furtaga [7], a pool in a canyon above the oasis, 16 September 2005: net. 3 ma, NMP, 17 September 2005: net. 4 ma, NMP, det. & rec. more inds. (Benda et al. 2008, 2012b, 2014b); – Ein Hodra [8], Wadi Hodra, 5 August 2005: obs. & rec. 2 inds. (Dietz 2005b, Dietz & Maltby 2006); Ain Hudra, oasis, 5 August 2005: det. & rec. 2 inds. (Benda et al. 2008); – El Milga [9], Fox Camp, 3 July 2006: [det.] many foraging inds. (Benda et al. 2008); – Feiran [10], oasis, 8 September 2005: det. 1 ind., 9 September 2005: det. min. 1 ind. (Benda et al. 2008); – Ras Muhammad National Park [11], Khashaba Beach, 11 September 2005: det. min. 1 ind. (Benda et al. 2008); – Wadi Arbain [12], Saint Katherine Research Centre, 29 July – 20 August 2005: obs. & rec. 1–5 inds. every night (Dietz 2005b, Dietz & Maltby 2006); Fox Camp, Saint Katherine, 1–5 inds. every night (Dietz & Maltby 2006); Wadi El Arbaein, St. Katherine Research Centre, 29 July – 20 August 2005: obs., det. & rec. 1–5 inds. (Benda et al. 2008); – Wadi Sheikh awad [13], Ecolodge Al-Karm, 17 August 2005: rec. 1 ind. (Dietz 2005b, Dietz & Maltby 2006); Shiekh Awad, El Karm Ecolodge, 17 August 2005: det. 1 ind. (Benda et al. 2008).

IMPRECISE RECORDS. Égypte, les souterrains des grands édifices (Temminck 1826 [as *Dysopes Rupellii*]); In imis aedibus Aegypti (Fischer 1829 [as *Molossus Rüppellii*]); Égypte (Lesson 1834 [as *Nyctinomus Rüppellii*]); Egypt (Gray 1838 [as *Nyctinomus Rüppellii*]); Egypten, Gewölben (Wagner 1840 [as *Dysopes Rüppellii*]); Aegypten, 2 inds., SMF (Rüppell 1842b [as *Dysopes Cestonii*]); Égypte (Gervais 1854 [as *Molossus Cestonii*]); Aegypten (Wagner 1855, Kolenati 1956, 1860a [as *Dysopes Cestonii*]); Ägypten (Fitzinger & von Heuglin 1866 [as *Nyctinomus Rüppellii*]); Aegypten (Hartmann 1868 [as *Nyctinomus Rueppellii*]); Ägypten (Fitzinger 1870c [as *Nyctinomus Rüppellii*]); Egypt (Dobson 1876b [as *Nyctinomus cestonii*]); Egypten (von Heuglin 1877 [as *Dysopes Cestonii*]); Égypte (Trouessart 1879 [as *Nyctinomus Cestonii*]); Egitto (Doria 1887 [as *Nyctinomus Cestonii*]); Égypte, 2 inds., RNHL (Jentink 1887 [as *Nyctinomus cestonii*]); Égypte, 5 inds., RNHL (Jentink 1888 [as *Nyctinomus cestonii*]); Ägyptus (Trouessart 1897 [as *Nyctinomus Cestonii*]); Egypt (Allen 1939 [as *Mops rüppellii*]); Egypt (Hoogstraal 1955, 1956); Egypt, 23 inds. (Wells & Randall 1956); Egypt (Myers et al. 1962); Egypt, coll. inds. (El Sabban et al. 1967 [as *T. ruppellii*]); Ägypten, 2 inds., SMF (Kock 1969); Egypt, 1 ind., FMNH (De-Blase 1972a, 1980); Egypt (Madkour 1976b); A. R. Egypt, inds. (Madkour 1977c); Egypt, 2 inds., SMF (Nader & Kock 1980, Kock & Nader 1984); Egypt, 14 inds., FMNH, USNM (Qumsiyeh 1985); Ägypten, 1 m, NMW (Benda et al. 2012b, 2014b); Ägypten, before 1822: 2 inds., SMF (Benda et al. 2012b, 2014b). – Unternubien, in Ruinen (Hartmann 1968 [as *Nyctinomus Rueppellii*]). – Nubia (Dobson 1876b, 1878 [as *Nyctinomus cestonii*]). – vicinity of Cairo [6] and Giza [2–5] Province, October 1959 – October 1961: 2 inds. (Mohammed & Saoud 1965).

DISTRIBUTION. *Tadarida teniotis* represents a rather uncommon bat species in Egypt, it has been documented from 13 sites (Fig. 32; Table 2). It was found in three geographical regions of the

country; more than a half of the sites are known from Sinai where *T. teniotis* is a medium-frequent bat (Benda et al. 2008), in the Cairo Region it is a rather uncommon bat species (Qumsiyeh 1985), and in the Western Desert, it was (repeatedly) recorded only in one oasis, Wadi El Natrun (Wassif et al. 1984, Benda et al. 2014a).

The Egyptian records of *T. teniotis* are available from a very wide altitude range of –10–1780 m a. s. l. (median 153.0 m, mean 484.8 m; Fig. 4, Table 3). However, the localities in the continental African part of Egypt lie in a very narrow range of lowland altitudes (–10–153 m a. s. l.; median 32.5 m, mean 49.2 m), while the Sinaitic records come from a very wide altitude range of 12–1780 m a. s. l. (median 680.0 m, mean 858.1 m; Fig. 5, Table 4). Although the continental and Sinaitic altitude ranges largely overlap, they represent different distribution types; whilst *T. teniotis* occurs in lowland altitudes in the continent, it lives mostly in mountains in Sinai.

Aellen (1966) suggested the BMNH specimens of *T. teniotis* reported to come from Giza or near Giza (cf. Lewis & Harrison 1962, Qumsiyeh 1985, Benda et al. 2012b, 2014b) to originate in fact from Abu Rawash. However, this problem seems to be irrelevant nowadays, since additional records are available from the El Jizah Governorate, including those from Imbaba, Giza Pyramids, and Saqqara, besides the numerous ones from Abu Rawash per se. Moreover, all these sites lie very close to each other (the largest distance between them is around 26 km) and show *T. teniotis* to occur across the whole Cairo agglomeration. Considering the superb flight capability of *T. teniotis*, the site affiliations seem to be rather arbitrary in the Cairo Region (although in most cases the sites perhaps represent the roosts of these bats). Very probably, majority of the geographically unspecified old records of *T. teniotis* from Egypt originate from this area too, since until the 1980s this bat was known only from the Cairo Region in the country (Qumsiyeh 1985). The first record from Wadi El Natrun was published by Wassif et al. (1984) and in Sinai this bat was discovered as late as in 2005 (Benda et al. 2008).

The reports of this species from Nubia (Hartmann 1968, Dobson 1876b, 1878) are based on a different taxonomic opinion that considered also the currently separate species *Mops midas* (Sundevall, 1843) to be a part of the species rank of *T. teniotis* (see below). So, a relevant evidence of occurrence of the latter bat from Nubia is not available.

The Egyptian distribution area of *T. teniotis* represents one of the few occurrence spots of this bat in Africa, besides Egypt this bat occurs in Cyrenaica and the Maghreb (see the review by Benda et al. 2014b); the African parts of the range create the south-western limits of the species distribution, covering mainly the Mediterranean arboreal zone of Europe, Africa, and the Middle East (Ibáñez & Arlettaz 2013). While in the west of the Egyptian range, a gap in the occurrence is apparent across the Western Desert, in the east the range continues directly to the abundant occurrence in the Levant and the northern part of the Middle East as well (Harrison & Bates 1984, Mendelssohn & Yom-Tov 1999, Benda et al. 2006, 2010, 2012b, 2016b).

TAXONOMY. *Tadarida teniotis* was discovered in Egypt by Eduard Rüppell, who collected (at least) five bats during his first expedition to Africa in 1822–1827; these specimens remained the only known examples of this bat from Egypt for a long time. Rüppell sent this series of specimens from Egypt to the SMF collection, then three of them were sent by P. J. Cretzschmar from the SMF to the RNHL (Temminck 1826, Jentink 1888, Kock & Nader 1984). Based on these specimens, Coenraad J. Temminck (1778–1858) described a new species in 1826, *Dysopes Rupelii*, and as its locality he mentioned “Égypte, les souterrains des grands édifices” (Temminck 1826: 224). Other two specimens of *T. teniotis* were collected by the physician Antoine B. Clot Bey (1793–1868) during his medical practice in Egypt in 1825–1849, the bats were deposited to the RNHL collection (Jentink 1888). Jentink (l.c.) reported an additional alcoholic specimen to be a part of the type series of *D. rupelii*, but Kock & Nader (1984) consider it an error. Further specimens came

from Egypt only at the beginning of the 20th century, at least seven bats were collected in the period 1903–1908 and deposited in the BMNH and MSNG collections (Bonhote 1909, Flower 1932, Benda et al. 2012b).

Since Temminck (1826) mentioned just ‘Egypt’ as the locality of origin of *Dysopes Rupelii*, the type locality was mentioned in this way for a long time (Allen 1939, Ellermann & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Harrison 1964, Aellen 1966, Atallah 1977, Corbet 1978, Kock & Nader 1984). Qumsiyeh (1985: 71) also first mentioned the type locality as defined by Temminck, i.e., Egypt, finally he restricted the type locality with the following argument: “The species is known only from the Cairo and Giza areas, and the oldest specimens were known only from Cairo’s old buildings. I therefore restrict the type locality to Cairo.”. However, Qumsiyeh did not support the restriction by any evidence of the origin of the ‘oldest specimens’ (= type series, see above). Kock & Nader (1984) and Benda et al. (2014b), who examined the SMF part of the type series, found the specimens labelled just ‘Ägypten’, the restriction to ‘Cairo’ is thus unjustified. Anyway, the Qumsiyeh’s restriction was not accepted by the subsequent authors (see Harrison & Bates 1991, Bates & Harrison 1997, Horáček et al. 2000, Benda et al. 2006, 2008).

The spelling of the species name changed several times, since Temminck used originally the erroneous spelling *Rupelii* as a patronym derived from the name Rüppell (as he indicated by the designation of a vernacular name ‘Molosse Ruppel’); Fischer (1829: 91) modified the name to *Rüppelii*, then Lesson (1834: 135) to *Ruppellii*, and finally Hartmann (1868: 43) first used an emended version of the name acceptable by the current nomenclature, *Rueppellii*.

Shortly after the description of *Dysopes Rupelii*, this bat was compared with *Tadarida teniotis*, as described by Savi (1825: 229) under the name *Dinops Cestoni*. Temminck (1827) and Savi (1828) discussed possible close relationship of *D. cestoni* and *D. rupelii*, and most of subsequent authors really considered the two forms conspecific and mentioned this bat from Egypt under the species name *cestoni/cestonii* (Rüppell 1842b, Gervais 1854, Wagner 1840, 1855, Kolenati 1956, 1860a, Dobson 1876b, von Heuglin 1877, Trouessart 1879, 1897, Doria 1887, Jentink 1887, 1888), while only few authors rejected this taxonomic arrangement and used the species name *rüppellii/rueppellii* for assignation of the Egyptian populations of this bat (Fitzinger & von Heuglin 1866, Fitzinger 1870c, Hartmann 1868).

On the other hand, the scarcity of records of the molossid bats from north-eastern Africa and their final rarity in collections lead to some misinterpretations in the taxonomy of the group in Egypt. Fitzinger & von Heuglin (1866: 545) reported the species *Nyctinomus Rüppellii* to be distributed as follows: “In Ägypten ziemlich selten, häufiger in Sennaar.” Although they considered *Nyctinomus Midas* [= *Mops midas*] and *N. Geoffroyi* [= *N. aegyptiacus*] as separate species along with *N. Rüppellii* [= *T. teniotis*], the mention of Sennaar (a country along the Blue Nile in the Sudan) within the distribution of the latter species is based on a misinterpreted record of *M. midas*. Dobson (1876b, 1878) unified five different names (*cestonii*, *rüppellii*, *midas*, *insignis*, *ventralis*) in a rank of one species, *Nyctinomus cestonii* [= *T. teniotis*], of them only *cestonii* and *rüppellii* are nowadays regarded synonyms of *T. teniotis*, while the others represent separate species of two different genera (see e.g., Simmons 2005, Taylor 2019). This taxonomic conception was accepted by Thomas (1891), who first used the name *Nyctinomus tæniotis* to assign this broadly considered species.

Perhaps as a consequence of this synthetic approach, cumulating several nominate taxa into one species rank (moreover, without a supporting finding), Anderson (1902) reported only one molossid bat species from Egypt, under the name *Nyctinomus aegyptiacus*, with synonyms *Dysopes geoffroyi* [= *N. aegyptiacus*] and *D. rupelii* [= *T. teniotis*]. However, William E. de Winton (1856–1922), who posthumously edited the Anderson’s book, did not agree and added a note to the book, in which he reported also *T. teniotis* from Egypt (pp. 154–155), and argued for separate

positions of three NE African forms (under the current nomenclature here): *Tadarida teniotis*, *Nyctinomus aegyptiacus*, and *Mops midas*, based on apparent morphological differences (see also de Winton 1901a).

Despite Bonhote (1909) and Flower (1932) reported numerous records of *Tadarida teniotis* from Egypt, Allen (1939) still considered *Dysopes Rupelii* (and *Nyctinomus ventralis*) to be conspecific with *Mops midas* over which it has a priority, giving the new name combination *Mops riippellii*, and regarded *T. teniotis* to be a species not distributed in Africa at all. However, Ellermann & Morrison-Scott (1951) revised Allen's (1939) opinion and separated *midas* and 'rupelii' again, the latter being a junior synonym of *T. teniotis* at a level of subspecies.

Numerous subsequent authors considered the name *rueppellii* fitting the populations of *T. teniotis* occurring in Egypt and this geographic coverage is indisputable considering the origin of the type series (Ellermann & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Hoogstraal 1962, Lewis & Harrison 1962, Harrison 1964, Aellen 1966, Kock 1969, Hayman & Hill 1971, Gaisler et al. 1972, Atallah 1977, Kock & Nader 1984, Qumsiyeh 1985, 1996, Harrison & Bates 1991, Horáček et al. 2000, Ibáñez & Arlettaz 2013). Similarly as in *Plecotus christii*, the geographical extent of the range of *T. teniotis rueppellii* has been reported in various meanings. Some authors broadened the range from Egypt to the whole North Africa and/or to the Middle East (Lewis & Harrison 1962, Harrison 1964, Hill 1964, Aellen 1966, Hayman & Hill 1971, Atallah 1977, Harrison & Bates 1991, Qumsiyeh 1996, Mendelssohn & Yom-Tov 1999, Horáček et al. 2000, Ibáñez & Arlettaz 2013).

The differences between the nominotypical subspecies, nominally occurring in the European Mediterranean, and *T. t. rueppellii* were evaluated first by Lewis & Harrison (1962: 477); these authors found dissimilarity only in the pelage colouration, *T. t. rueppellii* having a "decidedly paler gray-brown colour of the back which lacks warm brown tint of *T. t. teniotis*". Based on this definition, Kock & Nader (1984) reported *T. t. rueppellii* from Egypt, Lebanon, Turkey, and Israel, while *T. t. teniotis* to be distributed in southern Europe and in Algeria and Tunisia; later, Kock (1987) assigned also the populations of Morocco and Libya to the nominotypical form. These findings restricted the possible occurrence of *T. t. rueppellii* to Egypt and the western parts of the Middle East only (see Ibáñez & Arlettaz 2013).

However, the pelage colouration traits were shown to be very variable throughout the range of *T. teniotis* and not useful for geographical separation of populations; both colour morphs as well as intermediate stages between them were reported from southern Europe as well as from some parts of the Middle East and North Africa (see Benda et al. 2008 for a review). Even within the series of seven specimens collected at Ain El Furtaga, Sinai, Benda et al. (2008: 77) observed almost a continuum in their pelage colouration tinges. The dorsal pelage in the darkest specimens was dark chestnut brown while silverish brown-grey in pale bats; the ventral pelage was slightly paler brown and very pale brown to creamy, respectively. Three bats were dorsally dark brown, two pale silverish brown-grey and two specimens showed an approximately intermediate tinge between those two marginal variations. Such a mixture of colour morphs suggests that the suitability of the pelage colouration for subspecies differentiation is very limited. Although the percentage of pale and/or greyish individuals in the Egyptian and Middle Eastern populations could be really higher than in the European and Maghrebian populations, such a difference could represent marginal stages of a cline shift rather than step distinction among some populations. Thus, Benda et al. (2008) suggested to refuse the subdivision of the species into two subspecies based solely on colouration morphs, regarding also the suggestions by the other authors (e.g., Allen 1966, Qumsiyeh 1985, Horáček et al. 2000, Ibáñez & Pérez-Jordá 2004, Albayrak 2014). This opinion was already presented by Corbet (1978) and Koopman (1994), who considered the species as monotypic in the western Palaearctic; newly this view was accepted by Taylor (2019).

However, besides the discussed colour variability that was considered to be of taxonomic relevance, also a certain morphometric variation was observed in *T. teniotis* throughout its range (Benda et al. 2012b). The comparison of metric data revealed populations of rather small-sized bats in Europe and Cyrenaica, and rather large-sized bats in the Maghreb, Iran, and West Turkestan, while the samples from the Levant and Egypt were medium-sized. Thus, Benda et al. (2012b) suggested that this geographically discontinual plasticity in body size could be related to climatic conditions in the particular range parts; large bats seem to occur in higher mountains or continental steppes, while small bats in the coastal areas of the Mediterranean Basin.

The results of colouration and morphometric comparisons of *T. teniotis* indicate that the variability in body size and pelage colouration represents rather local (and perhaps individual in the case of colour) variation than any clear phylogenetic and geographical trends. As a next step, Amorim et al. (2020) carried out a molecular genetic analysis of *T. teniotis* populations of the Mediterranean Basin, unfortunately without representatives from Egypt, Cyrenaica, Caucasus, Iran, and West Turkestan. Anyway, the results of this analysis supported the above view of a single phylogenetic unit within the species rank of *T. teniotis* in the Mediterranean and a continual change of genetic characters between populations, rather than a step-like distinction that could justify a taxonomic division. Thus the available evidence indicates that the Egyptian populations of *T. teniotis* do not represent a taxon separated at any level from the nominotypical population of southern Europe.

Nyctinomus aegyptiacus Geoffroy, 1818

RECORDS. Published data: A s w a n: Aswan [1], palm garden at the N edge of the town, 24 January 2010: det. calls of several inds. (Benda et al. 2014a). – E l B a h r E l A h m a r: Bir Kohila [2] in SW Qattar massive, May/June 1984: net. 5 m (Osborn 1988); Bir Kohila, Qattar Mts, 30 May 1984: 5 m, NMP (Benda et al. 2008, 2012b, Benda & Gaisler 2015); – Bir Nagat [3] in NW Qattar massive, May/June 1984: net. 1 m (Osborn 1988); Bir Nagat, Qattar Mts, 2 June 1984: 1 m, NMP (Benda et al. 2008, 2012b, Benda & Gaisler 2015); – 20 km südl. Hurghada [4], Rotes Meer, 23 September 1965: 1 m, SMF (Kock 1969); – 20 km s. Hurghada, Red Sea, 23 September 1965: 1 m, SMF (Nader & Kock 1980, Kock 1999a); Hurghada (Wassif 1995); – Koseir [5], coll. 1 ind. (Klunzinger 1878 [as *N. tragatus*]); El Qusair (Wassif 1995). – E l J i z a h: Aburoash [6], 31 March 1903: 2 inds. (Flower 1932); Abu Rawash, 20 October 1951: inds., 3 October 1952: 1–2 inds. (Traub 1954); Abu Rawash, 3 October 1952: 1–2 inds. (Hopkins & Rothschild 1956); Abur Rawash, 18 December 1952: 1 ind. (Keegan 1956); Abu Rawash, October 1952: 1 ind. (Hubbard 1960); Abu Rawash, inds. (Heyneman & Macy 1962); Abu Rawash, June, October (Hoogstraal & Traub 1963); Abu Rawash, 18 December 1952: 1 ind. (Radovsky 1967); Abu Roash, ZFMK (Kock 1969); nr. Abu Rawash, 14 July 1959: obs. 1 ind. (Štys 1971); Abu Rawash, 1949: inds. (Haas & Tomich 1973); Abu Rawash, coll. 20 inds. (Madkour 1977b); Abu Rawash (Madkour 1978); Abu Rawash, 2 f, 2 inds., October 1947: 4 m, July 1966: 2 m, ASUC (Wassif et al. 1984); Abu Rawash, 25 inds., BMNH, FMNH, USNM (Qumsiyeh 1985); Abu Rawash 3 October 1952: coll. inds. (Adams & Lewis 1995); Abu Rawash (Wassif 1995); Abu Rawash, 3 October 1952: 1 ind. (Lewis 2006); Abu Roach, 31 March 1903: 2 inds., BMNH (Benda et al. 2012b, Benda & Gaisler 2015); – Cairo Area (Hoogstraal 1952); Giza [7] (Sanborn & Hoogstraal 1955); Giza area, caves near cultivations (Hoogstraal 1962); Giza, 25 June 1959: 1 ind., 15 July 1959: inds. (Ussinger 1960, 1966); Giza, 1 ind., BMNH (Qumsiyeh 1985). – E l U q s u r: El Uqsur (Luxor) [8], El Karnak Temple, 28 January 2010: coll. a skull from *Tyto alba* pellets (Benda et al. 2014a).

IMPRECISE RECORDS. Aegypten, in alten Häusern und Höhlen (Oken 1816); Egypte, vieux édifices et les cavernes (Geoffroy 1818, 1828); Egypte (Desmarest 1820); Égypte, tombeaux et les souterrains des grands édifices abandonnés (Temminck 1826 [as *Dysopes Geoffroyi*]); In Aegyptio (Fischer 1829); Égypte (Lesson 1834); Egypt (Presl 1834); Egypten, Gräbern und anderen unterirdischen Gewölben (Wagner 1840 [as *Dysopes Geoffroyi*]); Aegypten, 1 ind., SMF (Rüppell 1842b [as *Dysopes Geoffroyi*]); Aegypten (Wagner 1855 [as *Dysopes Geoffroyi*]); Ägypten (Fitzinger & von Heuglin 1866 [as *N. Geoffroyi*]); Aegypten (Hartmann 1868); Ägypten (Fitzinger 1870c [as *N. Geoffroyi*]); Egypt (Dobson 1876b); Egypten (von Heuglin 1877 [as *Dysopes Geoffroyi*]); Egypte (Trouessart 1879); Ägyptus (Trouessart 1897); Egypten (Palacký 1901); Ägyptus (Trouessart 1904); Egitto, 1883: 1 ind. (Sonsino 1895); Egypte (Gohar 1934); Egypt (Allen 1939); Egypte, 1 ma, MNHN (Rode 1941); Egypt (Hoogstraal 1955, 1956); Egypt, 5 inds. (Wells & Randall 1956); Egypt, 2 inds., BMNH (Hill 1961); Ägypten, 1903: 1 ind., ZFMK (von Lehmann 1964); Ägypten, 1 ind., SMF (Kock 1969); Egypt (Madkour 1976b);

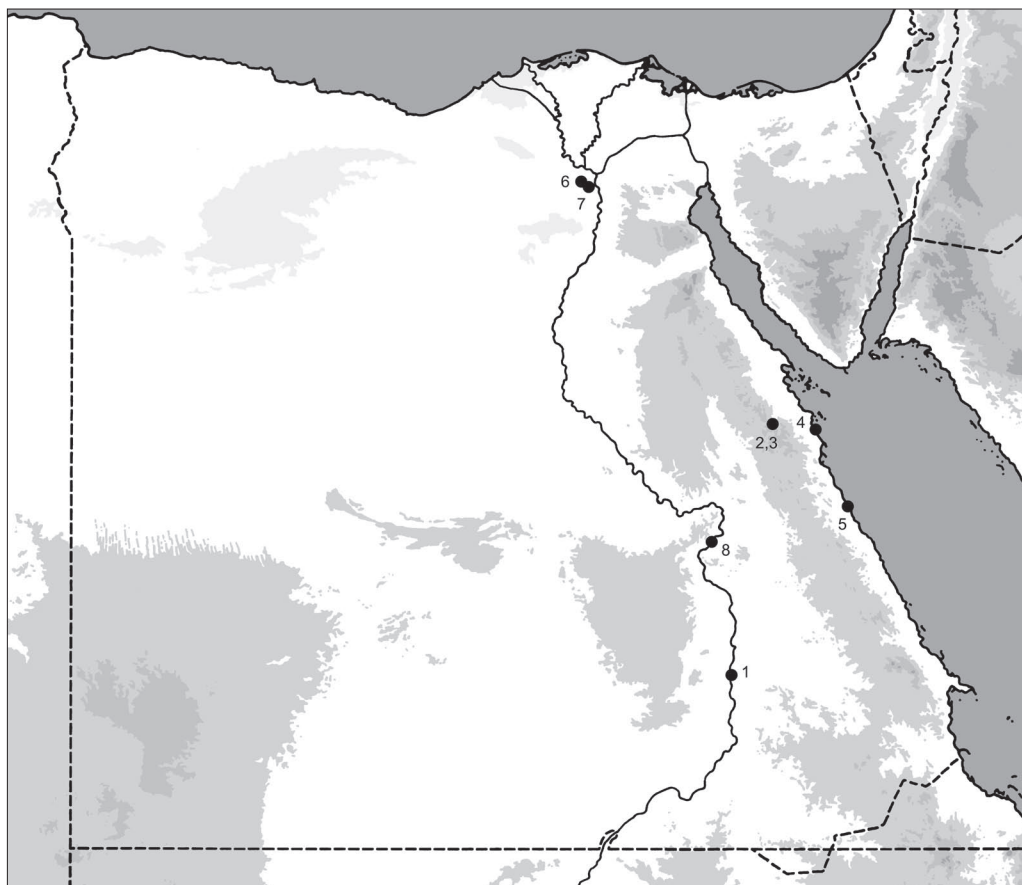


Fig. 33. Records of *Nyctinomus aegyptiacus* Geoffroy, 1818 in Egypt; for explanations see Fig. 3.

A. R. Egypt, inds. (Madkour 1977c); Egypte, 1 ind., MNHN (Benda et al. 2012b, Benda & Gaisler 2015). – vicinity of Cairo and Giza Province [6–7], October 1959 – October 1961: 4 inds. (Mohammed & Saoud 1965).

DISTRIBUTION. *Nyctinomus aegyptiacus* is a rare bat species in Egypt, it has been found only in eight sites (Fig. 33; Table 2). It was documented from three geographical regions of the country, only two sites are available from each of the Nile Valley and Cairo Region, where this bat belongs to the rarest bat species. On the other hand, four sites were reported from the Red Sea shore and mountains, making *N. aegyptiacus* the most frequently recorded bat in this scarcely surveyed region.

The records of *N. aegyptiacus* from Egypt come from a medium wide altitude range of 12–1085 m a. s. l. (median 84.0 m, mean 300.9 m; Fig. 4, Table 3).

The current picture of *N. aegyptiacus* distribution in Egypt conforms to the view given by Qumsiyeh (1985) only partially; the numbers of record sites has not changed only in the Cairo Region and the Red sea shore. On the other hand, *N. aegyptiacus* has been newly discovered to

occur in the Red Sea mountains (Osborn 1988) and in the southern part of the Nile Valley (Benda et al. 2014a).

The Egyptian distribution range of *N. aegyptiacus* is one of the limited projections from the sub-Saharan occurrence into the Sahara, similarly as in the Maghreb (Kowalski & Rzebik-Kowalska 1991, Bendjeddou et al. 2016, Aulagnier et al. 2017). Although this bat was also found as a rare inhabitant of the southern parts of the Middle East (see Harrison & Bates 1991, Benda et al. 2012b, Benda & Gaisler 2015), the main distribution range of *N. aegyptiacus* covers patchily the African dry steppes from Morocco to South Africa (Bernard & Happold 2013c, Monadjem et al. 2020). However, distribution of this bat in the northern and central parts of Africa is known just from few records spread over a huge area, and cannot be considered well studied; *N. aegyptiacus* has not been found in Libya so far (Benda et al. 2014b) and just recently it has been documented in Morocco, Western Sahara, and Tunisia (Denys et al. 1995, Benda et al. 2004c, Bendjeddou et al. 2016, Aulagnier et al. 2017). Paradoxically, the rather scarce presence of *N. aegyptiacus* in Egypt actually represents one of the most abundantly inhabited occurrence spots of this bat in Africa north of the Equator.

TAXONOMY. *Nyctinomus aegyptiacus* as a species was first described by Geoffroy (1818) on the basis of a specimen from Egypt (Fig. 13); nevertheless, the author did not specify the locality of collection of this bat, he only stated that (p. 130): “Les nyctinomes habitent les vieux édifices et les cavernes”. Anyway, the subsequent authors considered this bat an inhabitant of Egypt (Oken 1816, Desmarest 1820, Temminck 1826, Fischer 1829, Lesson 1834, Presl 1834, Wagner 1840, 1855, Fitzinger & von Heuglin 1866, Fitzinger 1870c, Hartmann 1868, Dobson 1876b, von Heuglin 1877, Trouessart 1879, 1897, 1904, Palacký 1901). However, Anderson (1902: 152) added as follows: “E. Geoffroy St.-Hilaire [= Geoffroy 1818] does not state in what part of Egypt he met with this bat, and it is strange that no museum, that I am aware of, possesses a specimen which may undoubtedly be ascribed to Egypt proper.” Despite this, most authors adopted the Egyptian origin of the type specimen and mentioned ‘Egypt’ as the type locality of *N. aegyptiacus* (Holister 1918, Flower 1932, Allen 1939, Ellerman & Morrison-Scott 1951, Sanborn & Hoogstraal 1955, Hill 1961, Harrison 1964, Kock 1969, Corbet 1978, Harrison & Bates 1991, Corbet & Hill 1992, Bates & Harrison 1997, Monadjem et al. 2020). Koopman (1975: 422), who primarily mentioned ‘Egypt’ as the type locality, added the following statement: “I hereby restrict the type locality to Giza, where several of the other bats described by E. Geoffroy originated; most later Egyptian specimens of this species have come from near this locality.” This restriction was accepted by some of the subsequent authors (Qumsiyeh 1985, Koopman 1993, Horáček et al. 2000, Simmons 2005, Bernard & Happold 2013c, Lanza et al. 2015, Taylor 2019). However, the lectotype specimen of *N. aegyptiacus*, currently housed in the MNHN collection, bears the locality ‘Egypte’ on its label (Rode 1941, Benda et al. 2012b, Benda & Gaisler 2015) and thus, this location should be considered as the type locality of this name. The two arguments given by Koopman (1975) as a support for his restriction could be well doubted; Étienne Geoffroy Saint-Hilaire described bats from localities in the whole Egyptian length of the Nile, viz., Qau El Kebir, Dendera, Thebes, Erment, and Kom Ombo, and only two bat species were reported by him from Giza; the distribution range of *N. aegyptiacus* covers a large part of eastern Egypt (Fig. 33), and although many specimens of this bat were collected in Giza, this site does not represent the most important site of its Egyptian occurrence, only the site of highest collection effort. We thus do not consider the restriction of the type locality to ‘Giza’ by Koopman (1975) justified, but regard ‘Egypt’ as the type locality of *N. aegyptiacus*.

Dysopes Geoffroyi Temminck, 1826 is another name that appeared concerning the Egyptian populations of *N. aegyptiacus*. Temminck (1826: 226) created this name as a nomen novum for

Nyctinomus Aegyptiacus Geoffroy, 1818 with a reference to an explanation of such name change in *Rousettus aegyptiacus* (see Taxonomy under this species). Although *Dysopes geoffroyi* Temminck was adopted by several authors as a valid name for this bat (Wagner 1840, 1855, Rüppell 1842b, Fitzinger & von Heuglin 1866, Fitzinger 1870c, von Heuglin 1877), it represents merely a junior synonym of *Nyctinomus aegyptiacus* Geoffroy.

For more than a century after its description, *N. aegyptiacus* has been considered a monotypic species distributed only in Egypt, in terms of its initial definition (see Records above), and later mentioned to occur also in other parts of Africa (de Winton 1901a, Trouessart 1904, Thomas & Hinton 1923, von Wettstein 1916, 1918, Holister 1918, Allen 1939). Ellerman & Morrison-Scott (1951) and Ellerman et al. (1953) first joined several nominate taxa into the species rank of *N. aegyptiacus*, including three Asian and two African forms, considering most of them as separate subspecies. Under this conception, this bat is a widespread and polytypic species, living in the area stretching from southern Africa to India and comprising up to five subspecies (see e.g., Koopman 1994, Horáček et al. 2000). Most frequently, the nominotypical subspecies has been reported to occur in north-eastern Africa and southern Arabia (Sanborn & Hoogstraal 1955, Harrison 1956, 1964, Hoogstraal 1962, Kock 1969, Corbet 1978, Qumsiyeh 1985, Harrison & Bates 1991, Horáček et al. 2000), and most recently, it is considered to occur in Arabia and in most of Africa except for the south-western part of the continent (Hayman & Hill 1971, Koopman 1994, Simmons 2005, Bernard & Happold 2013c, Lanza et al. 2015). On the other hand, Taylor (2019) suggested *N. aegyptiacus* to be (surprisingly) monotypic, i.e., without any sign of intraspecific variation. The definition of particular subspecies within the species rank of *N. aegyptiacus* is based mostly on the differences observed in the body size and pelage colouration (see the review by Benda et al. 2012b).

Based on morphometric comparison of a large set of specimens from the northern part of the species distribution range (North Africa, Middle East, India), Benda et al. (2012b) suggested to split the traditional above defined species rank of *N. aegyptiacus* s.l. into two morphologically distinct species, large-sized bats with a short and wide rostrum they assigned to *N. aegyptiacus* s.str. and small-sized bats with a long and narrow rostrum to *N. thomasi* (Wroughton, 1919). These two morphotypes were demonstrated to occur in sympatry in the southern part of the Middle East and in India, while the large-sized form in allopatry in North Africa. This separation did not affect the taxonomic affiliation of the Egyptian populations of *N. aegyptiacus*, they remained in the rank of *N. aegyptiacus* s.str. On the other hand, the revision by Benda et al. (2012b) challenged the justification of the intraspecific division of these two newly defined species.

Since several authors doubted the pelage colouration to be an important character for the evaluation of geographical variation in *N. aegyptiacus* s.l., being extremely variable, even within particular populations of this bat (Brosset 1962, Sinha 1970, Harrison & Bates 1991, Koopman 1994, Bates & Harrison 1997), i.e., similarly as in *Tadarida teniotis* (see above), the metric characters remain the only useful data for determination of the degree of intraspecific variation (besides the genetic traits). Concerning this character type, *N. aegyptiacus* s.str. seems to represent a monotypic species within the examined range part (cf. Benda et al. 2012b), i.e., from West Africa to India.

DISCUSSION AND CONCLUSIONS

The present review summarises at least 526 records of 20 bat species from the territory of Egypt (Tables 1, 2). In comparison with the previous review of Egyptian bats by Qumsiyeh (1985), the number of species in the country has decreased by two species; *Pipistrellus aegyptius* (= *P. deserti*) and *Pipistrellus bodenheimeri* (= *Hypsugo bodenheimeri*) were shown to be components of other

species, *Pipistrellus kuhlii* and *Hypsugo ariel*, respectively (Benda et al. 2008, 2015). However, the number of bat records (localities per species) and the average number of records per species have increased more than twice in comparison with the last review (Table 1). In a quarter of the species number, the amount of their records in Egypt increased more than three times compared to the review by Qumsiyeh (1985).

Considering the area of the country and the number of bat records, the bat fauna of Egypt is relatively well known in comparison with other countries of North Africa and the Middle East (see e.g., Mendelssohn & Yom-Tov 1999, Benda et al. 2006, 2007, 2010, 2012b, 2014b, 2016b, Shehab et al. 2007, Dalhoumi et al. 2011, Puechmaille et al. 2012, Aloufi et al. 2016, Ahmim & Oubaziz 2017, Aulagnier et al. 2017). However, the knowledge of bat distribution in Egypt is quite unbalanced from the geographical point of view. Slightly more than a half of the total number of records and the highest numbers of species are known from just two geographical regions of Egypt, the Nile Valley and Cairo Region, while in three other regions, the Mediterranean Sea shore, Nile Delta, and the Red Sea shore and mountains, only 17.0% of the records are available altogether (Table 2). In the region of the smallest area, the Cairo Region, the highest number of bat species was recorded. Moreover, in the Nile Valley the records are also unbalanced from the geographical point of view, since most of the records and also the most diverse fauna are known from the central and northernmost parts (Aswan, Luxor, and Faiyum regions), while from the Nubian part of the Valley (ca. 23% of the Egyptian Nile length excl. the Delta) and the long part between Faiyum and Luxor (ca. 46%), only few species were reported. These relations clearly indicate some regions being greatly understudied concerning the bat fauna. More intensive field research in these regions could change the picture of fauna both concerning its composition and distribution pattern.

Anyway, the fauna of Egypt is comparatively rich in comparison with the faunas of the neighbouring countries of North Africa, Libya and Tunisia, where 18 and 21 species occur, respectively (Dalhoumi et al. 2011, Benda et al. 2014b, Bendjeddou et al. 2016); a similar number of bat species occurs also in Lebanon, 21 (Benda et al. 2016b). On the other hand, in comparison with the faunas of the other Levantine countries, the Egyptian fauna is slightly poorer, in Palestine s.l. (Israel and the Palestine Lands), Syria, and Jordan, 31, 27, and 26 species are known to occur, respectively (Mendelssohn & Yom-Tov 1999, Benda et al. 2006, 2010). This difference is caused by a much larger proportion of the Mediterranean elements within the faunas of the latter countries, compared to the Egyptian fauna.

In the bat fauna of Egypt, only two species can be considered abundant and widespread, *Rousettus aegyptiacus* and *Pipistrellus kuhlii*. Only these two species are distributed in all seven geographical regions of the country and their records represent almost a third of the total number of bat records from Egypt (31.5%). Two other species, *Asellia tridens* and *Rhinopoma cystops*, are also common, although their records are not so numerous and were documented in five geographical regions of Egypt only, both are missing in the Mediterranean parts of the country, the Nile Delta and Mediterranean Sea shore (Table 2). The sum of records of these four species represents almost a half of the total number of bat records in the country (49.0%). Six species (30% of the fauna, 32.7% of records) can be considered as rather frequent or medium-frequent bats of Egypt, they are represented by 24–33 records per species, viz. *Rhinolophus clivosus*, *Taphozous perforatus*, *T. nudiventris*, *Nycteris thebaica*, *Otonycteris hemprichii*, and *Plecotus christii*. The remaining ten species, a half of the bat fauna of Egypt, represent in total only 18.4% of Egyptian bat records and belong to the categories of uncommon or rare bats of the country.

The occurrence pattern in some species has changed significantly compared to the distribution picture reviewed by Qumsiyeh (1985). During the last 35 years, occurrence of several species was discovered in the oases of the Western Desert (besides Wadi El Natrun), namely *Rousettus*

aegyptiacus, *Taphozous nudiventris*, and *Vansonia rueppellii*. Similarly, several species were first documented from Sinai in the last 15 years, namely *Rousettus aegyptiacus*, *Rhinopoma cystops*, *Taphozous perforatus*, *Eptesicus bottae*, and *Tadarida teniotis*. In some of these species, the distribution pattern in Egypt has thus changed dramatically, e.g., in *Rousettus aegyptiacus*, the records in these newly proved parts of its range represent more than a third of its total Egyptian records (36.4%). In *Taphozous nudiventris* and *Pipistrellus kuhlii*, their newly documented occurrence in the Western Desert represents 37.9% and 23.4% of their total Egyptian records, respectively. In some other species, the known occurrence area has changed slightly, especially it has spread within the already known geographical regions, e.g., *Rhinolophus hipposideros*, *Hypsugo ariel*, *Otonycteris hemprichii*, and *Barbastella leucomelas*, each known formerly from a single record in Sinai, are currently known from many records in a broader area of this peninsula. *Taphozous nudiventris*, formerly known from a single site in the Nile Valley per se, has been newly documented from seven localities of the central and northern parts of the Valley. *Eptesicus bottae*, *Otonycteris hemprichii*, and *Nyctinomus aegyptiacus*, all previously unknown from the Nile Valley south of Faiyum, have been newly documented from the Valley, each from two records. On the other hand, in several species, namely *Rhinopoma microphyllum*, *Rhinolophus clivosus*, *R. mehelyi*, and *Nycteris thebaica* (20% of the fauna), the occurrence pattern in Egypt did not change significantly in comparison to that described by Qumsiyeh (1985).

The zoogeographical affinities of the Egyptian bat fauna as well as the zoogeographical rating of the particular species were assessed in detail by Qumsiyeh (1985). However, since the taxonomic positions/affiliations have changed in several species and/or populations of the Egyptian bats, the grouping of taxa had to be slightly revised, since also the whole distribution pattern in some species changed. Of the twenty species of the fauna, in the group (1) of the predominantly Afrotropical bats, six species could be ranked (six species were ranked to this group also by Qumsiyeh 1985), *Rousettus aegyptiacus*, *Taphozous perforatus*, *Nycteris thebaica*, *Vansonia rueppellii*, *Nycticeinops schlieffenii*, and *Nyctinomus aegyptiacus*. The group (2) of the “intermediate” bats sensu Qumsiyeh (1985) that represents the Saharo-Sindian (or the Saharo-Arabian) faunal elements, nine species can be included (eight by Qumsiyeh 1985), *Rhinopoma microphyllum*, *R. cystops*, *Taphozous nudiventris*, *Asellia tridens*, *Eptesicus bottae*, *Hypsugo ariel*, *Otonycteris hemprichii*, *Barbastella leucomelas*, and *Plecotus christii*. Qumsiyeh (1985) classified only two bat species of the Egyptian fauna to the group (3) of the Mediterranean species, here we include four species to this group, *Rhinolophus hipposideros*, *R. mehelyi*, *Pipistrellus kuhlii*, and *Tadarida teniotis*. The last species, *Rhinolophus clivosus*, in its strict meaning (sensu Benda & Vallo 2012) belongs to the group (2) of the Saharo-Sindian bats, in the traditional taxonomic meaning (sensu e.g., Simmons 2005) to the group (1) of the mainly Afrotropical bats.

The largest part of the bat fauna of Egypt (45–50%) is represented by the desert-dwelling species (group 2); in some of these species their distribution range is centered to Egypt or to the northern edge of the Red Sea (*Hypsugo ariel*, *Barbastella leucomelas*, *Plecotus christii*), in others, to the broad belt of deserts from the Western Sahara to the Indian subcontinent (*Rhinopoma microphyllum*, *Taphozous nudiventris*, *Asellia tridens*, *Otonycteris hemprichii*), and in two species the range extends from Egypt to Arabia and Iran (*Eptesicus bottae*) or to West Africa and Arabia (*Rhinopoma cystops*), respectively. The mainly Afrotropical bat species and the Mediterranean species create accessoric parts of the fauna of Egypt penetrating to the Sahara from the north and south, respectively, and use the Nile Valley as the main lane for the spreading from the Afrotropics to the Palaearctic (all six Afrotropical species) or in the opposite direction (*Pipistrellus kuhlii*). These two groups represent 30% and 20% of the fauna, respectively, and 31.9% and 20.1% of the total records of bats from Egypt, respectively. The relatively high proportion of records of the accessoric elements is caused by the anthrophilous habits of the two most common bats of Egypt,

Rousettus aegyptiacus (Afrotropical element) and *Pipistrellus kuhlii* (Mediterranean element), making them much more conspicuous and easily recordable, compared to other species.

The list of the bat fauna of Egypt seems to be rather complete, only very few theoretical possibilities to enrich the fauna remain. Moreover, the real occurrence of *Nycticeinops schlieffenii* in Egypt is here reasonably doubted (see above), this species was reported to be collected in the country twice in the first half of the 19th century only, under obscure circumstances. As concluded above, until the distribution of *N. schlieffenii* in Egypt is confirmed by a new record, the position of this species as a member of the fauna of the country remains dubious. In fact, the two available specimens could have been collected in the sub-Saharan range of *N. schlieffenii* and mislabelled as coming from Egypt. Thus, the bat fauna of Egypt could be actually even less numerous than here reported.

On the other hand, in the countries neighbouring Egypt, several bat species that have not yet been found in Egypt were recorded in the regions relatively near to the Egyptian border. These species could enrich the bat fauna of the country when appropriately careful field studies are made in certain regions. *Rhinolophus horaceki* Benda et Vallo, 2012 is perhaps a real such candidate – it is a species occurring in the Mediterranean part of Cyrenaica and in the north-eastern shore region of Libya, with the easternmost confirmed record from Al Bardiya, situated 10 km north-west of the Egyptian border (Benda et al. 2014b). This species thus could be found also in the region of Es Salum in the north-western corner of Egypt. Moreover, a theoretical possibility still remains that the record of *Rhinolophus clivosus* made at a site 35 km west of Marsa Matruh (some 170 km east of Al Bardiya), on the Mediterranean shore of north-western Egypt (Hoogstraal 1962), could pertain to *R. horaceki* instead of *R. clivosus* (for details see under the latter species above).

However, a possibility of record of any other bat species in Egypt is much more theoretical. Some species distributed in the southern Levant (see Harrison & Bates 1991, Mendelssohn & Yom-Tov 1999, Benda et al. 2010) could be found also in Sinai, since the habitat composition and physical topography of these two arid regions are very similar. Two species of bats that were found in Sinai, but do not occur in other parts of Egypt, are known also from the southern Levant (*Rhinolophus hipposideros*, *Barbastella leucomelas*) and some other desert dwelling species are equally common in both regions (*Eptesicus bottae*, *Hypsugo ariel*, *Plecotus christii*). Four other bat species are distributed in the southern Holy Land or even more south in the Arabian Peninsula, and thus, they can live also in Sinai, but have not been found there so far, namely *Rhinolophus blasii* Peters, 1866, *Myotis emarginatus* (Geoffroy, 1806), *Myotis hovei* Harrison, 1964, and *Pipistrellus pipistrellus* (Schreber, 1774). Although these species typically rank among the Mediterranean arboreal faunal elements, they have also formed southern Levantine arid dwelling populations, with a potential to be found also in Sinai, similarly to *Rhinolophus hipposideros* that belongs to the same faunal type.

Another source that could potentially enrich the bat fauna of Egypt is the fauna of southern Nubia – this region is inhabited by a mixture of the Palaearctic and Afrotropical faunas, and some sub-Saharan bat species that were reported from areas along the Nubian parts of the Nile Valley and Red Sea shore could be found in the corresponding parts of these areas in southern Egypt (which also represent parts of Nubia). Among such species, namely *Lavia frons* (Geoffroy, 1810), *Nycteris hispida* (Schreber, 1775), *N. macrotis* Dobson, 1876, *Coleura gallarum* Thomas, 1915, *Eptesicus floweri* (de Winton, 1901), *Chaerephon major* (Trouessart, 1897), and *Mops midas* (Sundevall, 1843) can be mentioned, according to their published records (Hartmann 1863, 1868, Peters 1871a, Matschie 1892, de Winton 1901b, Anderson 1902, Senna 1905, Thomas 1915b, Happold 1967, Kock 1969). Since both the Sudanese and Egyptian parts of Nubia belong to the least studied regions of Egypt and the Sudan, and the ranges of many faunal elements of Nubia are rather estimated than well known, the possibility of occurrence of these bats more to the

north and even in Egypt may not be only theoretical. Anyway, an enormous effort is necessary for the complete determination of the Nubian bat fauna and the distribution extent of its particulars. The available bat records from this area come just from a few expeditions, made mostly in the 19th century or at the beginning of the 20th century. Potentially, the arid mountains of south-eastern Egypt represent a region of much higher bat diversity than currently documented (see Herkt et al. 2016).

Concerning the old and/or unreliable reports of bats from Egypt, Qumsiyeh (1985: 74–76) presented a review of ‘Deletions from the faunal list of Egyptian bats’, in which he mentioned four bat species that were reported from the country based on erroneous species determination or misidentified record localities; (1) *Rhinolophus euryale* Blasius, 1853: mentions of this bat from Egypt were based on misidentified specimens of *R. mehelyi*, a species very similar to the former one and discovered a half century later than the former one, therefore many records were misinterpreted in its whole distribution range (for details see also above under *R. mehelyi*); (2) *Triaenops persicus* Dobson, 1871: this species was reported from Egypt erroneously (Allen 1939, Ellerman & Morrison-Scott 1951), confused most probably with *Asellia tridens*. (3) *Hypsugo savii* (Bonaparte, 1837): a SMF specimen of *Nycticeinops schlieffenii* collected (reportedly) in Suez was originally determined by Rüppell (1842b) as *H. savii* (reported also e.g., by Hartmann 1868), but the specimen was revised by Harrison (1961) who corrected the identification error. (4) *Chaerephon major* (Trouessart, 1897): the type locality of this species, the Fifth Cataract of the Nile, Sudan, was erroneously identified and placed to the Egyptian part of Nubia (Dobson 1878, de Winton 1901a), but this error was corrected by Kock (1969) and Koopman (1975).

However, the Qumsiyeh’s (1985) review of the names deleted from the list of the bat fauna of Egypt is not complete. In the literature, several other bat species were reported to occur Egypt, namely (under the current nomenclature) *Lavia frons* (Gray 1838, Jentink 1888), *Myotis myotis* (Borkhausen, 1797) s.l. (Hartmann 1868), *Myotis nattereri* (Kuhl, 1817) s.l. (Hartmann 1868), *Nyctalus noctula* (Schreber, 1774) (Hartmann 1868, von Heuglin 1877), and *Chaerephon pumilus* (Cretzschmar, 1830) (Gray 1838, 1843, Fitzinger 1870c, Palacký 1901). The mentions of *Rhinolophus capensis* and *R. ferrumequinum* from Egypt are discussed under *R. clivosus* above, and the numerous mentions of *Pipistrellus pipistrellus* under *Pipistrellus kuhlii*. In fact, none of these species has been recorded in Egypt; the reports by Hartmann (1868) are most probably the author’s expectation of occurrence estimated from faunal reports dealing with other parts of North Africa, and no real evidence of the species mentioned by him is available. The records of *Lavia frons* and *Chaerephon pumilus* reported by Gray (1838, 1843) and subsequent authors were made in those sections of the historical territory of Egypt that are now parts of other countries, Eritrea and the Sudan (see also Flower 1932).

In conclusion, the number of twenty bat species in the bat fauna of Egypt may not be final. The species number in the bat faunal list could decrease by one species whose available records from Egypt are doubtful, when additional evidence proves they are false in fact, and simultaneously, it could increase due to taxonomic splitting and/or detailed field research in the less studied regions of the country.

Acknowledgements

The preparation of this study was supported by the Ministry of Culture of the Czech Republic (# DKRVO 2019–2023/6.IX.b, 00023272). We thank Rainer Hutterer (ZFMK) who kindly allowed us to examine museum material under his care.

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GAZETTEER

Coordinates and altitudes of particular sites were determined mostly with help of Google Earth web application; in some cases the data were taken from literature; alt. = altitude [m a. s. l.]

site	governorate	coordinates	alt.
2 km of Giza Pyramids	El Jizah	29° 59' N, 31° 08' E	70
4 km W El Mansuriya	El Jizah	30° 08' N, 31° 01' E	42
5 mi. W El Qasr	Matruh	31° 22' N, 27° 10' E	4
5 mi. W Simbillawein	Ed Daqahliyah	30° 53' N, 31° 25' E	7
8 km W Sambillawein see 5 mi. W Simbillawein			
8 mi. SW of Giza Pyramids	El Jizah	29° 53' N, 31° 02' E	130
10 km N Cairo	El Qahirah	30° 08' N, 31° 14' E	17
10 km nördl. Kairo see 10 km N Cairo			
12 km W Wadi El Natroun	El Beheirah	30° 22' N, 30° 13' E	2
12 mi. W Wadi El Natrun see Kom Hamada			
15 mi. N. W. of Mersa Matruh see 15 mi. W Mersa Matruh			
15 mi. W Mersa Matruh	Matruh	31° 27' N, 26° 59' E	6
16 km south of Nag Hammadi see Nag Hammadi			
20 km S Cairo see 20 km S Kairo			
20 km S Hurghada	El Bahr El Ahmar	29° 24' N, 30° 25' E	40
20 km S Kairo	El Jizah	29° 49' N, 31° 14' E	42
20 km s. of Cairo see 20 km S Kairo			
20 km S von Kairo see 20 km S Kairo			
20 km südl. Hurghada see 20 km S Hurghada			
20 km südl. Kairo see 20 km S Kairo			
20 mi. E Cairo	El Qahirah	30° 02' N, 31° 28' E	263
20 mi. W Mersa Matruh	Matruh	31° 25' N, 26° 53' E	70
20 km west of El Arish see Zarnikh Island			
20 miles east of Cairo see 20 mi. E Cairo			
20 miles west of Mersa Matruh see 20 mi. W Mersa Matruh			
25 km W El Mansuriya	El Jizah	30° 08' N, 30° 49' E	96
30 km south of El-Arish see Magdabah			
Abbasia see Cairo, Abbasia			
Abo-Rawach see Abu Rawash			
Abo Rawash see Abu Rawash			
Abou roach see Abu Rawash			
Abou Simbel see Abu Simbel			
Abu Ghalib	El Jizah	30° 16' N, 30° 56' E	20
Abu Kawash see Abu Rawash			
Abu Rauwash see Abu Rawash			
Abu Rawash	El Jizah	30° 02' N, 31° 05' E	153
Abu Rawwash see Abu Rawash			
Abu Rihal	El Bahr El Ahmar	25° 00' N, 31° 28' E	229
Abu Roach see Abu Rawash			
Abu Roash see Abu Rawash			
abu rwash see Abu Rawash			
Abur Rawash see Abu Rawash			
Abu Simbel	Aswan	22° 20' N, 31° 38' E	190
Abu Simbl see Abu Simbel			
Abu Sir	El Jizah	29° 54' N, 31° 12' E	47
Aburawasch see Abu Rawash			
Aburoash see Abu Rawash			
Abusir see Abu Sir			
Aiatt see El Aiyat			
Ain El Furtaga	Janub Sina'	29° 03' N, 34° 33' E	240
Ain Hodra see Ain Hudra			
Ain Hudra	Janub Sina'	28° 54' N, 34° 25' E	680

site	governorate	coordinates	alt.
Ain Shams University	El Qalyubiyah	30° 08' N, 31° 19' E	21
Ain Sudr	Janub Sina'	29° 49' N, 33° 07' E	443
Al Arbaein Wadi El Arbaein			
Al Bahariya see Bahariyah Oasis, Bawiti, hill			
Al Kharga Oasis see El Kharga Oasis, El Kharga			
Alexandria see El Eskenderiah			
Alexandrien see El Eskenderiah			
Arish see El Arish			
Asmant see Dakhla Oasis, Ismant			
Assiut see Asyut			
Assiut University see Asyut			
Assuan see Aswan			
Aswan	Aswan	24° 07' N, 32° 54' E	92
Aswan, Temple of Philae see Philae			
Asyut	Asyut	27° 11' N, 31° 11' E	55
Ataka Mts.	Es Suwais	29° 56' N, 32° 24' E	345
Bahariya Oasis, Bawiti, garden	El Jizah	28° 21' N, 28° 52' E	98
Bahariya Oasis, Bawiti, hill	El Jizah	28° 23' N, 28° 54' E	130
Bahariya Oasis, Bawiti, mosque	El Jizah	28° 24' N, 28° 53' E	91
Bahariya Oasis, Bir Abu Darag	El Jizah	28° 21' N, 28° 55' E	122
Bahariya Oasis, El Hara	El Jizah	28° 20' N, 29° 07' E	116
Bahariya Oasis, Mandisha see Bahariyah Oasis, Bir Abu Darag			
Bahariya Oasis, Mandishah see Bahariyah Oasis, Bir Abu Darag			
Bahriya Oases, El Buaiti see Bahariyah Oasis, Bawiti, garden			
Bahig	El Eskenderiah	30° 56' N, 29° 36' E	27
Bahr El Roda	El Fayum	25° 25' N, 31° 00' E	-3
Bakkari	El Jizah	30° 01' N, 31° 08' E	21
Balat see Dakhla Oasis, Balat			
Banha	El Qalyubiyah	30° 28' N, 31° 11' E	20
Bani Suef	Bani Suef	29° 04' N, 31° 06' E	34
Bani Swaif see Bani Suef			
Barshum El Kubra	El Qalyubiyah	30° 19' N, 31° 06' E	14
Bashendi see Dakhla Oasis, Bashendi			
Bashindi see Dakhla Oasis, Bashendi			
Beer il Abed see Bir El Abed			
Beltim	Kafr Esh Sheikh	31° 33' N, 31° 05' E	9
Beni Hasan	El Miniya	27° 54' N, 30° 52' E	49
Beni Hassen see Beni Hasan			
Beni Suef see Bani Suef			
Beni Swaif see Bani Suef			
Bent Pyramid see Saqqara			
between Cairo and Ismailia see zw. Kairo und Ismailia			
Bilbis see El Tahawiya			
Bir Abraq	El Bahr El Ahmar	23° 25' N, 34° 48' E	314
Bir El Abed	Janub Sina'	28° 32' N, 33° 56' E	1850
Bir El Gabal see Dakhla Oasis, Bir El Gabal			
Bir El Nokta see Dakhla Oasis, Bir El Nokta			
Bir El Wastani see Dakhla Oasis, Bir El Wastani			
Bir Kohila	El Bahr El Ahmar	27° 03' N, 33° 21' E	1085
Bir Nagat	El Bahr El Ahmar	27° 06' N, 33° 22' E	880
Birket Qarun see Kom Oshim			
Birqash	El Jizah	30° 10' N, 31° 03' E	24
Borsa'id	Borsa'id	31° 16' N, 32° 18' E	3
Bourg El-Arab see Burg El Arab			
Budukhla see Dakhla Oasis, Budukhla			
Bulac el Darkur see Bulaq			

site	governorate	coordinates	alt.
Bulak see Bulaq			
Bulaq	El Qahirah	30° 04' N, 31° 14' E	23
Bulaq El Dakrur see Bulaq			
Burg El Arab	El Eskenderiah	30° 54' N, 29° 33' E	30
Burgh-el-Arab see Burg El Arab			
Cairo see El Qahirah			
Cairo, Abbasia	El Qahirah	30° 04' N, 31° 17' E	31
Cairo, Bar Kouky Mosque see El Qahirah			
Cairo, Barkoki Mosque see El Qahirah			
Cairo, Citadel see El Qahirah			
Cairo, El Barkoki Mosque see El Qahirah			
Cairo, El Khalig	El Qahirah	30° 01' N, 31° 14' E	21
Cairo, El Manyal	El Qahirah	30° 01' N, 31° 13' E	22
Cairo, El Zamalik see Cairo, Gezira Island			
Cairo, Gezira Island	El Qahirah	30° 03' N, 31° 13' E	20
Cairo, Maade see Maadi			
Cairo, Mohammed Ali Mosque see El Qahirah			
Cairo, Muqattam see El Qahirah			
Cairo, Soltan Barkouky Mosque see El Qahirah			
Cairo, Soltan Hassan Mosque see El Qahirah			
Cairo, Soltan Mahmoudy Mosque see El Qahirah			
Cairo, Sultan Barquq Mosque see El Qahirah			
Cairo, Sultan Hamid Mosque see El Qahirah			
Cairo, Sultan Hassan Mosque see El Qahirah			
Cairo, Sultan Mahmud Mosque see El Qahirah			
Dafaga Tempel see Dendera			
Dahshour see Dashur			
Dakhla Oasis, Asmant see Dakhla Oasis, Ismant			
Dakhla Oasis, Balat	El Wadi El Jadid	25° 34' N, 29° 16' E	135
Dakhla Oasis, Bashendi	El Wadi El Jadid	25° 33' N, 29° 18' E	125
Dakhla Oasis, Bir El Gabal	El Wadi El Jadid	25° 44' N, 28° 55' E	107
Dakhla Oasis, Bir El Nokta	El Wadi El Jadid	25° 41' N, 28° 47' E	107
Dakhla Oasis, Bir El Wastani	El Wadi El Jadid	25° 41' N, 28° 49' E	117
Dakhla Oasis, Budukhla	El Wadi El Jadid	25° 38' N, 28° 55' E	112
Dakhla Oasis, Deir El Hagar	El Wadi El Jadid	25° 40' N, 28° 49' E	122
Dakhla Oasis, El Awaina	El Wadi El Jadid	25° 34' N, 28° 58' E	127
Dakhla Oasis, El Gharghour see Dakhla Oasis, Gharghur			
Dakhla Oasis, El Mozawaka	El Wadi El Jadid	25° 39' N, 28° 54' E	112
Dakhla Oasis, El Qasr	El Wadi El Jadid	25° 42' N, 28° 53' E	125
Dakhla Oasis, Er Rashda see Dakhla Oasis, Rashda			
Dakhla Oasis, Ezab El Qasr	El Wadi El Jadid	25° 42' N, 28° 55' E	117
Dakhla Oasis, Gedida	El Wadi El Jadid	25° 35' N, 28° 52' E	116
Dakhla Oasis, Gharghur	El Wadi El Jadid	25° 36' N, 28° 52' E	113
Dakhla Oasis, Hindaw	El Wadi El Jadid	25° 33' N, 29° 00' E	104
Dakhla Oasis, Ismant	El Wadi El Jadid	25° 32' N, 29° 04' E	113
Dakhla Oasis, Kalamoun see Dakhla Oasis, Qalamun			
Dakhla Oasis, Mushieh see Dakhla Oasis, Mushyie			
Dakhla Oasis, Mushyie	El Wadi El Jadid	25° 37' N, 28° 52' E	116
Dakhla Oasis, Mut	El Wadi El Jadid	25° 29' N, 28° 59' E	117
Dakhla Oasis, Qalamun	El Wadi El Jadid	25° 34' N, 28° 53' E	103
Dakhla Oasis, Rashda	El Wadi El Jadid	25° 35' N, 28° 56' E	102
Dakhla Oasis, Tenaïda	El Wadi El Jadid	25° 31' N, 29° 20' E	130
Dakhla Oasis, Zakhir	El Wadi El Jadid	25° 32' N, 29° 17' E	125
Dakhleh Oasis, Bashendi see Dakhla Oasis, Bashendi			
Dakhleh Oasis, El Q'asr see Dakhla Oasis, El Qasr			
Damietta see Dumyat			

site	governorate	coordinates	alt.
Damiette see Dumyat			
Dandara see Dendera			
Daschur see Dashur			
Dashur	El Jizah	29° 47' N, 31° 13' E	57
Deir El Hagar see Dakhla Oasis, Deir El Hagar			
Deir El Medina see El Uqsur			
Delta Barrage	El Qalyubiyah	30° 12' N, 31° 11' E	18
Dendera	Qena	26° 09' N, 32° 40' E	76
Denderah see Dendera			
Deshna	Qena	26° 07' N, 32° 28' E	77
Desouk see El Malaheen			
Desouk see El Sawaqi			
Dir Rifa see Rifa			
Dra Abu El Naga see El Uqsur			
Dschise see El Jizah			
Dumyat	Dumyat	31° 25' N, 31° 49' E	5
Dziza see El Jizah			
E Desert of Egypt see Wadi Aladi			
E. Egypt Desert see Wadi Aladi			
East Solar area see Eastern Desert, East Solar area			
Eastern Desert caves see Wadi Dighla			
Eastern Desert, East Solar area	El Miniya	27° 42' N, 31° 08' E	275
eastern desert of Egypt see Wadi Aladi			
eastern desert of Nubia see Wadi Aladi			
Eastern Egyptian Desert see Wadi Aladi			
Edfina	El Beheirah	31° 18' N, 30° 31' E	10
Edfu	Aswan	24°59' N, 32° 52' E	92
Edfû see Edfu			
Ein Hodra see Ain Hudra			
Ein Urzarki-a not localised			
El A Aqab see El A'aqab			
El A'aqab	Aswan	24° 16' N, 32° 54' E	96
El A'qab see El A'aqab			
El Aiyat	El Jizah	29° 37' N, 31° 16' E	28
El Arish	Shamal Sina'	31° 08' N, 33° 48' E	16
El Asmak garden see Cairo, Gezira Island			
El Awaina see Dakhla Oasis, El Awaina			
El Badrshein	El Jizah	29° 51' N, 31° 16' E	26
El Bayayda, El Shekh Sayed Cave	Asyut	26° 57' N, 31° 28' E	120
El Cairo see El Qahirah			
El Eskenderiah	El Eskenderiah	31° 11' N, 29° 54' E	12
El Esma'iliyah	El Esma'iliyah	30° 36' N, 32° 17' E	5
El Etmannyieh	Asyut	26° 54' N, 31° 31' E	64
El Faiyum see Medinet El Fayum			
El-Fayoum see Medinet El Fayum			
El Gezira see Cairo, Gezira Island			
el-Gjdda see El Lageita			
El Gharghour..... see Dakhla Oasis, Gharghur			
El Jizah	El Jizah	29° 59' N, 31° 08' E	69
El Karnak see El Uqsur			
El Khalig see Cairo, El Khalig			
El-Khanka see El Qalag			
El Kharga Oasis see El Kharga Oasis, El Kharga			
El Kharga Oasis, El Kharga	El Wadi El Jadid	25° 29' N, 30° 33' E	76
El Kharga Oasis, palm oasis	El Wadi El Jadid	25° 25' N, 30° 33' E	62
El Khatatba see El Khatatbah			

site	governorate	coordinates	alt.
El Khatatbah	El Monufiyah	30° 23' N, 30° 50' E	13
El Lageita	Qena	25° 53' N, 33° 07' E	132
El Lahun	El Fayum	29° 13' N, 30° 59' E	30
El Maabdeh Cave	Asyut	27° 30' N, 31° 04' E	209
El Maadi see Maadi			
El Malaheen	Kafr Esh Sheikh	31° 11' N, 30° 39' E	3
El Manashi	El Jizah	30° 10' N, 31° 08' E	15
El Mansoria see El Mansuriya			
El Mansuriya	El Jizah	30° 08' N, 31° 04' E	19
El Manyal see Cairo, El Manyal			
El Milga, Deir Sant Katerin	Janub Sina'	28° 33' N, 33° 58' E	1580
El Milga, Fox Camp	Janub Sina'	28° 34' N, 33° 58' E	1570
El Milga, garden see El Milga, village			
El Milga, Mansour's house see El Milga, village			
El Milga, Rotog	Janub Sina'	28° 28' N, 34° 00' E	1685
El Milga, St. Katherine Research Centre	Janub Sina'	28° 33' N, 33° 57' E	1590
El Milga, village	Janub Sina'	28° 33' N, 33° 57' E	1550
El Monufiyah	El Monufiyah	30° 28' N, 30° 56' E	14
El Mozawaka see Dakhla Oasis, El Mozawaka			
El Qahirah	El Qahirah	30° 03' N, 31° 15' E	20
El Qalag	El Qalyubiyah	30° 11' N, 31° 21' E	22
El Q'asr see Dakhla Oasis, El Qasr			
El Qasr	Matruh	31° 22' N, 27° 08' E	15
El Qasr see Dakhla Oasis, El Qasr			
El Qatta	El Jizah	30° 14' N, 30° 58' E	25
El Qoseir	El Bahr El Ahmar	26° 06' N, 34° 17' E	12
El Qusair see El Qoseir			
El Riyad	Bani Suef	29° 14' N, 31° 09' E	26
El Salhiya	Esh Sharqiyah	30° 45' N, 32° 01' E	5
El Sawaqi	Kafr Esh Sheikh	31° 10' N, 30° 37' E	3
El Shohada	El Monufiyah	30° 36' N, 30° 54' E	10
El Suez see Suez			
El Tahawiya	Esh Sharqiyah	30° 27' N, 31° 38' E	10
El Tur	Janub Sina'	28° 16' N, 33° 36' E	13
El Uqsur	El Uqsur	25° 43' N, 32° 38' E	76
El Walidiya	Asyut	27° 12' N, 31° 11' E	56
El Zamalek see Cairo, Gezira Island			
El Zamalik see Cairo, Gezira Island			
El Zankalun	Esh Sharqiyah	30° 34' N, 31° 26' E	13
Elkab necropolis	Aswan	25° 08' N, 32° 48' E	102
Embaba	El Jizah	30° 05' N, 31° 13' E	18
Er Rashda see Dakhla Oasis, Rashda			
Ermant see Erment			
Erment	El Uqsur	25° 37' N, 32° 32' E	74
Ezab El Qasr see Dakhla Oasis, Ezab El Qasr			
Faiyum see Medinet El Fayum			
Farafra, Ain El Raml see Farafra Oasis, Qasr Farafra			
Farafra Oasis, Ain El Raml see Farafra Oasis, Qasr Farafra			
Farafra Oasis, cave 45 km NE	El Wadi El Jadid	27° 26' N, 28° 11' E	41
Farafra Oasis, Qasr Farafra	El Wadi El Jadid	27° 04' N, 27° 58' E	81
Farsh El Romana	Janub Sina'	28° 32' N, 33° 53' E	1810
Fayoum see Medinet El Fayum			
Fayum see Medinet El Fayum			
Feiran see Feiran Oasis			
Feiran, garden see Feiran, eastern garden			
Feiran, eastern garden	Janub Sina'	28° 42' N, 33° 40' E	715

site	governorate	coordinates	alt.
Feiran, El Braga Garden	Janub Sina'	28° 42' N, 33° 39' E	670
Feiran, pool	Janub Sina'	28° 43' N, 33° 37' E	595
Feiran Oasis	Janub Sina'	28° 42' N, 33° 38' E	660
Fox Camp see El Milga, Fox Camp			
Fuah	Kafr Esh Sheikh	31° 12' N, 30° 33' E	13
Garbu Suam see Aswan			
Garbu Suan see Aswan			
Gebel Adda	Aswan	22° 21' N, 31° 43' E	185
Gebel Ahmar	El Qahirah	30° 03' N, 31° 18' E	97
Gebel Drunka	Asyut	27° 08' N, 31° 11' E	70
Gebel El Ahmar see Gebel Ahmar			
Gebel El 'Ajmah	Janub Sina'	29° 07' N, 33° 54' E	1320
Gebel El Lahun	El Fayum	29° 14' N, 30° 58' E	45
Gebel Mukattam see El Qahirah			
Gebel Ter	El Miniya	28° 17' N, 30° 45' E	63
Gebelein	El Uqsur	25° 29' N, 32° 29' E	91
Gedida see Dakhla Oasis, Gedida			
Gezira Island see Cairo, Gezira Island			
Gharbia Governorate see Mahallet El Kebir			
Gharghour see Dakhla Oasis, Gharghur			
Ghizeh see El Jizah			
Giza see El Jizah			
Giza Pyramids see El Jizah			
Gizeh see El Jizah			
Gizeh see El Jizah			
Gyzeh see El Jizah			
Helwan	El Qahirah	29° 51' N, 31° 19' E	45
Henneh	Bani Suef	28° 51' N, 30° 54' E	34
Hindaw see Dakhla Oasis, Hindaw			
Hurghada see 20 km S Hurghada			
Idfina see Edfina			
Idfu see Edfu			
Il Cairo see El Qahirah			
Imbaba see Embaba			
island near Mersa Matruh see 15 mi. W Mersa Matruh			
Ismailia see El Esma'iliyah			
Ismant see Dakhla Oasis, Ismant			
Jabal El 'Ajmah see Gebel El 'Ajmah			
Jabal Musa see El Milga, Deir Sant Katerin			
Jaggarah see Saqqara			
Jebel Ahmar see Gebel Ahmar			
Jebel Al-Ahmar see Gebel Ahmar			
Jebel Drunka see Gebel Drunka			
Kafr Dawud	El Monufiyah	30° 28' N, 30° 50' E	16
Kairo see El Qahirah			
Kalamoun see Dakhla Oasis, Qualamun			
Karga Oasis see El Kharga Oasis, El Kharga			
Karnak see El Uqsur			
Kasr Karoon	El Fayum	29° 31' N, 30° 54' E	-2
Kharga Oasis, City of Deads see El Kharga Oasis, El Kharga			
Kharga Oasis, Hibis Temple see El Kharga Oasis, El Kharga			
Kharga Oasis, Temple of Ibis see El Kharga Oasis, El Kharga			
Khargah Oase see El Kharga Oasis, El Kharga			
Khayzam	Qena	25° 47' N, 32° 46' E	77
Khayzan see Khayzam			
Kom Hamada	El Beheirah	30° 46' N, 30° 42' E	10

site	governorate	coordinates	alt.
Kom Aushim see Kom Oshim			
Kom Ombo	Aswan	24° 27' N, 32° 56' E	96
Kom O Shim see Kom Oshim			
Kom Oshim	El Fayum	29° 31' N, 30° 54' E	1
Komo Shim see Kom Oshim			
Königsgräbern see El Uqsur			
Korosco see Korosko			
Korosko	Aswan	22° 36' N, 32° 20' E	180
Korusku see Korosko			
Koseir see El Qoseir			
Kurna see El Uqsur			
La Caire see El Qahirah			
Lake Karoun see Kom Oshim			
Lake Moeris	El Fayum	29° 28' N, 30° 42' E	-42
Lake Qarun see Kom Oshim			
Libyan desert W. of Alexandria	Matruh	30° 47' N, 29° 22' E	66
Lisht	El Jizah	29° 34' N, 31° 14' E	25
Luxor see El Uqsur			
Maade see Maadi			
Maadi	El Qahirah	29° 58' N, 31° 17' E	29
Magdabah	Shamal Sina'	30° 50' N, 33° 50' E	88
Mahallet El Kebir	El Gharbiyah	30° 58' N, 31° 10' E	7
Maidum see Mastab			
Massarah	El Qahirah	30° 04' N, 31° 14' E	19
Mastab	Bani Suef	29° 23' N, 31° 09' E	48
Mataria	El Qahirah	30° 07' N, 31° 18' E	23
Medinet El Fayum	El Fayum	29° 19' N, 30° 50' E	14
Medinet-Hâbû see El Uqsur			
Mehalla El Kubra see Mahallet El Kebir			
Memphis see El Jizah			
Mena House Hotel see El Jizah			
Menofia see El Monufiyah			
Mersa Matruh	Matruh	31° 21' N, 27° 14' E	5
Minia	El Miniya	28° 05' N, 30° 46' E	51
Minufiya see El Monufiyah			
Mokattam see El Qahirah			
Mokkatam see El Qahirah			
Monastery Wadi Natroun see Wadi El Natrun			
Montfalut, Krokodilhöhle see El Maabedeh Cave			
Mount Sinai see El Milga, Deir Sant Katerin			
Mt. Sinai see El Milga, Deir Sant Katerin			
Muqattam see El Qahirah			
Mushieh see Dakhla Oasis, Mushyie			
Mushyie see Dakhla Oasis, Mushyie			
Mut see Dakhla Oasis, Mut			
Nag Hammadi	Qena	26° 05' N, 32° 24' E	73
Nag Misaw	Aswan	22° 22' N, 31° 42' E	190
Nag Siteih see Nagaa El Sitayh			
Nagaa El Sitayh	El Uqsur	25° 28' N, 32° 30' E	82
Negoom	Esh Sharqiyah	30° 46' N, 31° 34' E	5
Oasis of Kharga, Christian Necropolis see El Kharga Oasis, El Kharga			
Oasis of Siwah see Siwa Oasis, Old Shaly			
Ombos see Kom Ombo			
Philae	Aswan	24° 01' N, 32° 53' E	114
Philæ see Philae			
Port Said see Borsa'id			

site	governorate	coordinates	alt.
Prison of Joseph see Saqqara			
Pyramiden von Gize see El Jizah			
Pyramiden zu Kairo see El Jizah			
pyramides de Ghizeh see El Jizah			
Pyramids of Giza see El Jizah			
Qalamun see Dakhla Oasis, Qalamun			
Qaliobia see Banha			
Qâou el-Koubara see El Etmanniyeh			
Qau El Kebir see El Etmanniyeh			
Qena	Qena	26° 10' N, 32° 43' E	87
Qiâou-el Koubara see El Etmanniyeh			
Qôm-Ombû see Kom Ombo			
Qurneh see El Uqsir			
Quseir see El Qoseir			
Ramleh	El Eskenderiah	31° 15' N, 29° 58' E	5
Ras Abu Darag	Es Suwais	29° 22' N, 32° 34' E	8
Ras Abu Daragh see Ras Abu Darag			
Ras El Khalig	Ed Daqahliyah	31° 12' N, 31° 31' E	11
Ras Muhammad National Park	Janub Sina'	27° 47' N, 34° 13' E	12
Ras Shukeir	El Bahr El Ahmar	28° 21' N, 33° 05' E	18
Rashda see Dakhla Oasis, Rashda			
Rifa	Asyut	27° 06' N, 31° 12' E	59
Roman burial cave see El Qasr			
Rotog see El Milga, Rotog			
Sabkhet El Bardawil see Zarnikh Island			
Sackhara see Saqqara			
Saint Katherine monastery see El Milga, Deir Sant Katerin			
Saint Katherine Research Centre see Wadi El Arbaein			
Sakhara see Saqqara			
Sakkara see Saqqara			
Sakkara, El Aiyat see El Aiyat			
Sakkarah see Saqqara			
Sakkoura see Saqqara			
San El Hagar El Gibiliya	Esh Sharqiyah	30° 57' N, 31° 55' E	3
Saqârah see Saqqara			
Saqqara	El Jizah	29° 51' N, 31° 13' E	45
Sayala	Aswan	23° 03' N, 32° 45' E	179
Second Pyramid at Gizeh see El Jizah			
Seila	El Fayum	29° 21' N, 30° 58' E	10
Serapeum	El Jizah	29° 53' N, 31° 13' E	42
Sharm El Sheikh, airport	Janub Sina'	27° 59' N, 34° 23' E	59
Shebin El Kom	El Monufiyah	30° 33' N, 31° 01' E	20
Sheik Awad, Awad garden see Sheikh Awad, El Karm Ecolodge			
Sheik Awad, Ecolodge see Sheikh Awad, El Karm Ecolodge			
Sheik Awad, Mohammed's Garden see Sheikh Awad, El Karm Ecolodge			
Sheik Awad, Oder's Garden see Sheikh Awad, Sulliman's Garden			
Sheikh Ali see Sheikh Jarad			
Sheikh Awad, Awad Garden see Sheikh Awad, El Karm Ecolodge			
Sheikh Awad, El Karm Ecolodge	Janub Sina'	28° 39' N, 33° 53' E	1130
Sheikh Awad, Mohammed's Garden see Sheikh Awad, El Karm Ecolodge			
Sheikh Awad, Sulliman garden see Sheikh Awad, Sulliman's Garden			
Sheikh Awad, Sulliman's Garden	Janub Sina'	28° 38' N, 33° 54' E	1140
Sheikh Jarad	Aswan	24° 19' N, 32° 54' E	95
Shellal see Aswan			
Sherbin	Ed Daqahliyah	31° 11' N, 31° 31' E	15
Shirbin Sherbin			

site	governorate	coordinates	alt.
Simbillawein see 5 mi W Simbillawein			
Sinnuris	El Fayum	29° 25' N, 30° 52' E	12
Siout see Asyut			
Siwa see Siwa Oasis, Old Shaly			
Siwa, Shali see Siwa Oasis, Old Shaly			
Siwa Oasis see Siwa Oasis, Old Shaly			
Siwa Oasis, Abu El Sherouf	Matruh	29° 11' N, 25° 45' E	-13
Siwa Oasis, Al-Senoseya see Siwa Oasis, El Zeytun			
Siwa Oasis, El Zeytun	Matruh	29° 10' N, 25° 47' E	-16
Siwa Oasis, Old Shaly	Matruh	29° 12' N, 25° 31' E	-7
Siwa Oasis, Gabal al-Dakror see Siwa Oasis, Old Shaly			
Siwa Oasis, pond	Matruh	29° 12' N, 25° 33' E	-12
Siwa Oasis, Shali see Siwa Oasis, Old Shaly			
Siwa Oasis, tomb see Siwa Oasis, Old Shaly			
Sohag	Sohaj	26° 33' N, 31° 42' E	76
Souez see Suez			
Southeastern Desert see Bir Abraq			
St. Catherine Monastery see El Milga, Deir Sant Katerin			
St. Katherine village see El Milga, village			
St. Katrina village see El Milga, village			
Suez	Es Suwais	29° 58' N, 32° 33' E	5
Syene see Aswan			
Tanboul see 5 mi W Simbillawein			
Tanta	El Gharbiyah	30° 47' N, 31° 00' E	13
Taranis El Arab	Ed Daqahliyah	30° 52' N, 31° 30' E	11
Tel el Amarna see Tel El Amarnah			
Tel El Amarnah	El Miniya	27° 39' N, 30° 54' E	52
Tel El Kebir	Esh Sharqiyah	30° 34' N, 31° 46' E	10
Tell El Maskhuṭa	El Esma'iliyah	30° 33' N, 32° 06' E	11
Temple of Hathor see Dendera			
Tenaida see Dakhla Oasis, Tenaida			
Thebe see El Uqsur			
Theben see El Uqsur			
Thebes see El Uqsur			
Théby see El Uqsur			
tombeaux des rois see El Uqsur			
Tombs of Kings see El Uqsur			
Tor see El Tur			
Tukh see Barshum El Kubra			
Tuna El Gebel	El Miniya	27° 44' N, 30° 42' E	68
Tura	El Qahirah	29° 56' N, 31° 17' E	20
Um Hashiba see Umm Khisheib			
Umm Khisheib	Shamal Sina'	30° 19' N, 33° 00' E	407
Unnamed island see 15 mi. W Mersa Matruh			
Valley of Kings see El Uqsur			
Valley of Queens see El Uqsur			
Wadi Aladi	El Bahr El Ahmar	22° 00' N, 35° 00' E	510
Wadi Arbain see Wadi El Arbaein			
Wadi Degla see Wadi Dighla			
Wadi Dighla	El Qahirah	29° 57' N, 31° 23' E	130
Wadi Digla see Wadi Dighla			
Wadi El Alaqi see Wadi Aladi			
Wadi El Arbaein	Janub Sina'	28° 32' N, 33° 58' E	1780
Wadi El Braga Camp see Wadi Sulaf			
Wadi El Feiran see Feiran Oasis			
Wadi El Natroun see Wadi El Natrun			

site	governorate	coordinates	alt.
Wadi El Natrun	El Beheirah	30° 22' N, 30° 21' E	-10
Wadi Feiran see Feiran Oasis			
Wadi Feiran, Breyga garden see Feiran, El Braga Garden			
Wadi Feiran, garden el Braga see Feiran, El Braga Garden			
Wadi Gharaba see Wadi Kharba			
Wadi Gebal, Hussein's Garden	Janub Sina'	28° 32' N, 33° 54' E	1870
Wadi Hibran, Bedouin village	Janub Sina'	28° 27' N, 33° 41' E	247
Wadi Hibran, camp at the pass to Wadi Sulaf	Janub Sina'	28° 37' N, 33° 44' E	945
Wadi Hodra see Ain Hudra			
Wadi Itfah	Janub Sina'	28° 35' N, 33° 55' E	1460
Wadi Kharba	Janub Sina'	28° 39' N, 33° 55' E	1190
Wadi Kid	Janub Sina'	28° 20' N, 34° 12' E	580
Wadi Klar	Janub Sina'	28° 35' N, 33° 55' E	1455
Wadi Maghara	Janub Sina'	28° 53' N, 33° 22' E	288
Wadi Marra	Janub Sina'	28° 46' N, 34° 11' E	980
Wadi Nasb	Janub Sina'	28° 30' N, 34° 08' E	1260
Wadi Nassim	El Uqsar	25° 15' N, 32° 27' E	125
Wadi Nassin see Wadi Nassim			
Wadi Natron see Wadi El Natrun			
Wadi Natroun see Wadi El Natrun			
Wadi Sa'al	Janub Sina'	28° 45' N, 34° 14' E	905
Wadi Shagg	Janub Sina'	28° 32' N, 33° 56' E	1890
Wadi Shagg/Wadi Klar see Bir El Abed			
Wadi Sheikh Awad see Sheikh Awad, El Karm Ecolodge			
Wadi Sheikh awad, Ecolodge Al-Karm see Sheikh Awad, El Karm Ecolodge			
Wadi Siba'a	Aswan	24° 19' N, 32° 54' E	180
Wadi Sulaf	Janub Sina'	28° 38' N, 33° 49' E	1105
Wadi Talaah	Janub Sina'	28° 45' N, 34° 14' E	1550
Walidiya see El Walidiya			
Wardan	El Jizah	30° 19' N, 30° 54' E	18
West of El Mansuriya see 25 km W El Mansuriya			
Zagazig see El Zankalun			
Zakhir see Dakhla Oasis, Zakhir			
Zamalek see Cairo, Gezira Island			
Zarnikh see Zarnikh Island			
Zarnikh Island	Shamal Sina'	31° 09' N, 33° 28' E	3
Zawyet Umm El Rakham	Matruh	31° 24' N, 27° 03' E	6
Zokila see El Qahirah			
zw. Cairo und Isma'iliya see zw. Kairo und Ismailia			
zw. Kairo und Ismailia	Esh Sharqiyah	30° 32' N, 31° 46' E	5